SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1944

No. 424

THE UNITED STATES, APPELLANT

vs.

DAVID McD. SHEARER

APPEAL FROM THE COURT OF CLAIMS

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1 In the Court of Claims

No. 41829

DAVID McD. SHEARER, PETITIONER

v.

THE UNITED STATES, DEFENDANT

Petition

Filed January 16, 1932

To the Honorable, the Judges of the United States Court of Claims:

The petition of David McD. Shearer respectfully represents:

1. That your petitioner is a citizen of the United States and is now in the Corps of Engineers, United States Army, as a captain, and at present stationed at Fort Mills, Corregidor, Philippine Islands; and that the defendant is the United States.

2. That your petitioner brings this action in his own right, under and by virtue of the Patent Laws of the United States, and pursuant to an act of Congress, Private—No. 285—71st Congress, approved December 17, 1930, entitled "An Act for the Relief of David McD. Shearer," reading as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the claim of David McD. Shearer for compensation for the use

2 by the Government of the United States of certain inventions relating to reinforced-concrete revetment and construction and laying of same, made by said David McD. Shearer, and for which letters patent of the United States, numbered 1173879, 1173880, and 1229152 were issued to him, be, and the same is hereby, referred to the Court of Claims, which court is hereby vested with jurisdiction in the premises, and whose duty it shall be to hear and determine any statute limiting the time within which such an action may be brought to the contrary notwithstanding, first, whether the said David McD. Shearer was the first, original, and sole inventor of the inventions described in said letters patent or any of them; and if said court shall find that he was such first, original, and sole inventor of any of the same, then to determine, second, what amount of compensation, if any, he is justly entitled to receive from the United States for the use of his said inventions or any of them, since the date of said letters patent, up to the time of adjudication. In determin-

ing whether or not said David McD. Shearer is entitled to compensation and the amount of compensation, if any, for the use of said inventions the court shall take into consideration, if and so far as the facts may warrant, the facts, if proved, that while said David McD. Shearer was engaged in perfecting the invention he was in the service of the United States as a junior engineer superintendent in charge of willow bank revetment construction under the Mississippi River Commission, and whether and, if at all, to what extent said inventions or any of them were discovered or developed during the working hours of his Government service, and to what extent his said inventions for protection of river channels and banks differ from the methods previously used, in material, method of laying, permanency, and value, and, whether if at all to what extent the expense of making experiments, trials, and tests for the purpose of perfecting said inventions was
3 paid by the United States, and if any such expense was incurred by the United States, whether and, if at all, to what extent the United States received compensation for such expense.

"Either party may appeal to the Supreme Court of the United States upon any such question where appeals now lie in other cases, arising during the progress of the hearing of said claim, and from any judgment in said case, at any time within ninety days after the rendition thereof; and any judgment rendered in favor of the claimant shall be paid in the same manner as other judgments of said Court of Claims."

Approved, December 17, 1930.

3. That, heretofore, and before the 30th day of December 1914, your petitioner, being a citizen of the United States and a resident of Greenville, in the County of Washington and State of Mississippi, was the true, original, first, and sole inventor of certain new and useful improvements in Revetments, not known or used by others in this country before his invention or discovery thereof, not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, or more than two years prior to his application for a patent in this country therefor, not patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to said application for patent in this country, and not in public use or on sale in this country for more than two years prior to the said application for patent in this country; and so being the true, original, first, and sole inventor thereof, your petitioner made due application, according to law, for Letters Patent of the United

States therefor, on the 30th day of December 1914; and, on the 29th day of February 1916, upon his said application, and in conformity to law, Letters Patent, in the name of the United States of America, dated February 29, 1916, No. 1,173,879, duly executed and recorded, sealed with the seal of the Patent Office, and signed by the Commissioner of Patents, according to law, were duly granted to your petitioner, whereby there was granted and secured, or intended to be granted and secured, to him, his heirs and assigns, for the term of seventeen years from and after the said 29th day of February 1916, the exclusive right to make, use and vend throughout the United States and territories thereof, the invention aforesaid, a description whereof, in the words of your petitioner, was given in the schedule annexed to said Letters Patent and made a part thereof, as by reference to said Letters Patent will more fully and at large appear, a copy of which is filed herewith as a part hereof, marked "Exhibit A."

4. That, heretofore, and before the 20th day of August 1915, your petitioner, being a citizen of the United States and a resident of Vicksburg, in the County of Warren, and State of Mississippi, was the true, original, first, and sole inventor of certain new and useful improvements in Revetment Molds, not known or used by others in this country before his invention or discovery thereof, not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, or more than two years prior to his application for a patent in this country therefor, not patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to said application for patent in this country, and not in public use or on sale in this country for more than two years prior to his said application for patent in this country; and so being the true, original, first, and sole inventor thereof, your petitioner made due application, according to law, for Letters Patent of the United States therefor, on the 20th day of August 1915; and, on the 29th day of February 1916, upon his said application and in conformity to law, Letters Patent, in the name of the United States, dated February 29, 1916, No. 1,173,880, duly executed and recorded, sealed with the seal of the Patent Office and signed by the Commissioner of Patents, according to law, were duly granted to your petitioner, whereby there was granted and secured, or intended to be granted and secured, to him, his heirs, and assigns, for the term of seventeen years from and after the said 29th day of February 1916, the exclusive right to make, use, and vend throughout the United States and

territories thereof, the invention aforesaid, a description whereof, in the words of your petitioner, was given in the schedule annexed to said Letters Patent and made a part thereof, as by reference to said Letters Patent will more fully and at large appear, a copy of which is filed herewith as a part thereof, marked "Exhibit B."

5. That, heretofore, and before the 6th day of October 1915, your petitioner, being a citizen of the United States, and a resident of Vicksburg, in the County of Warren and State of Mississippi, was the true, original, first, and sole inventor of certain new and useful improvements in Apparatus for Launching Revetment Mats, not known or used by others in this country before his invention or discovery thereof, not patented or described in any printed publication in this or any foreign country
6 before his invention or discovery thereof, or more than two years prior to his application for a patent in this country therefor, not patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to said application for patent in this country, and not in public use or on sale in this country for more than two years prior to his said application for patent in this country; and so being the true, original, first, and sole inventor thereof, your petitioner made due application, according to law, for Letters Patent of the United States therefor, on the 6th day of October 1915; and, on the 5th day of June 1917, upon his said application and in conformity to law, Letters Patent, in the name of the United States of America, dated June 5, 1917, No. 1,229,152, duly executed and recorded, sealed with the seal of the Patent Office and signed by the Commissioner of Patents, according to law, were duly granted to your petitioner, whereby there was granted and secured, or intended to be granted and secured, to him, his heirs and assigns, for the term of seventeen years from and after the said 5th day of June 1917, the exclusive right to make, use, and vend throughout the United States and territories thereof, the invention aforesaid, a description whereof, in the words of your petitioner, was given in the schedule annexed to said Letters Patent and made a part thereof, as by reference to said Letters Patent will more fully and at large appear, a copy of which is filed herewith as a part hereof, marked "Exhibit C."

6. That your petitioner is, and has been ever since the grant thereof, the owner of the entire exclusive right, title, and interest in and to said inventions and Letters Patent, and each of
7 them, and in and to all rights of action for the past or future infringement of said Letters Patent.

7. That, during the period when your petitioner conceived and was engaged in perfecting and reducing to a practical state the

said inventions, as described and claimed in said Letters Patent, he was employed in the civil service of the United States, as Junior Engineer superintending the construction of the standardized willow bank revetment under the Mississippi River Commission; that your petitioner was not employed, nor was it in the line of his regular duties, to make, conceive, perfect or develop said inventions; that said inventions were not made, discovered, conceived, developed, or perfected during working hours of his Government service; that the expense of making experiments, trials, and tests for the purpose of perfecting said inventions, and the cost of applying for and securing patents for said inventions, and of reducing said inventions to practical form, was paid by your petitioner, and was not paid by the United States; and that said inventions of your petitioner, as described and claimed in said Letters Patent, differ greatly in type, design, and construction from devices and methods previously employed, and that the use of said inventions by the United States resulted in the rapid and economical production of revetments superior in economy, adaptability, and effective life to the type of revetment which it displaced, thus effecting considerable savings in the construction of revetments, both in first cost and maintenance, besides possessing many other engineering and construction advantages.

8. That, after he had conceived, developed, and perfected the said inventions disclosed and claimed in said Letters Patent, your petitioner submitted his said inventions to his superior officer, Arthur Hider, Principal Assistant Engineer and senior civilian employee of the Mississippi River Commission, in the Third Mississippi River District, and to other officials of the Mississippi River Commission, as a suggestion of means for improving the laying of lower bank revetments, which, if adopted by the Mississippi River Commission, would result in lessening the cost of revetment construction, and increasing the permanency of such revetments; that said inventions were submitted by your petitioner with the understanding that, if adopted and used, he should be properly compensated for such adoption and use, and without any suggestion, direct or implied, that such inventions were the property of the Government, or that the Mississippi River Commission was free to use such inventions without compensating your petitioner for such use; that the Mississippi River Commission, however, did not immediately adopt and employ the inventions submitted by your petitioner, but on the contrary experimented with other and different schemes for employing concrete in the construction of lower bank revetment which schemes proved to be failures and were later abandoned; that in August, 1915, Major John R. Slattery, Corps of Engineers, United States Army, who was then District Engineer of the Third Mississippi

River District, did conduct, independently, a small experiment involving the Shearer inventions or the principles thereof under circumstances which your petitioner did not regard as conforming in spirit or act to the original understanding which led him to expose and submit his inventions to representatives of the Mississippi River Commission, and in which your petitioner after disagreement did not participate; that some time in
9 the year 1916, subsequent to the issuance of his Letters Patent, Nos. 1,173,879, and 1,173,880, your petitioner was ordered by his superior officer, Major Slattery, to supervise the construction of equipment, in accordance with the Shearer inventions, for laying your petitioner's patented revetment, and to supervise the laying of such revetment in the Third Mississippi River District of the Mississippi River Commission, and that your petitioner, in the expectation of receiving reasonable compensation therefor, engaged in such work, under the orders of Major Slattery, until on or about May 8, 1917, when he left the employ of the Mississippi River Commission to enter the United States Army, in which he has served ever since, having had nothing further to do, since that date, with the work of the Mississippi River Commission in the construction of revetments.

9. That, beginning in the year 1917 and continuing up to the present time, the defendant, through the Mississippi River Commission, has constructed and laid more than eighty million square feet of revetment embodying the invention described and claimed in your petitioner's said Letters Patent, No. 1,173,879; that, in constructing such revetment, the defendant has made use of, and employed, molds embodying the invention described and claimed in your petitioner's said Letters Patent, No. 1,173,880; and that, in laying or installing said revetment mats, the defendant has employed apparatus for launching revetment mats embodying the invention described and claimed in your petitioner's said Letters Patent, No. 1,229,152; that said eighty million square feet of revetment have been laid by the defendant, through the Missis-
sippi River Commission, without any or proper compen-
10 sation to your petitioner, in infringement of one or more, or all of your petitioner's said Letters Patent, at a cost of about twelve million ($12,000,000) dollars, or more, whereby the defendant has directly saved about four million ($4,000,000) dollars or more, by reason of the lessened first costs of such patented revetment over that previously known and employed and has indirectly saved other large sums in maintenance costs, durability, and effectiveness.

10. That the construction and use of such revetment, revetment molds, and apparatus for launching revetment mats, by the defendant, as aforesaid, was and is without the license or con-

sent of your petitioner, and without lawful right, and in violation and infringement of your petitioner's said Letters Patent, Nos. 1,173,879, 1,173,880, and 1,229,152, and your petitioner's rights thereunder.

11. That such unlawful and unauthorized use by the defendant of petitioner's patented inventions has resulted in great injury damage, and loss to your petitioner, to wit, as petitioner is informed and believes, and therefore, avers, the aggregate sum of four million ($4,000,000) dollars, which sum is still due petitioner, no part thereof having been paid him, and which sum, or such reasonable compensation for the manufacture and use of your petitioner's said patented inventions by the defendant, as this honorable Court may find to be due the petitioner, the petitioner avers he is fully entitled to recover from the defendant.

12. That your petitioner has not sold or transferred his said claim against the defendant, or any part of the same, to any person or persons; that no action has been taken on the
11 merits of his claim in Congress or in any of the departments of the United States Government, and that his said claim still remains unsatisfied.

13. That your petitioner has not in any way, voluntarily aided, abetted, or given encouragement to rebellion against the Government of the United States, but has always borne true allegiance thereto.

Wherefore, by force of the statutes of the United States, and particularly by virtue of the special act of Congress, Private—No. 285—71st Congress, hereinabove referred to, passed in petitioner's behalf, approved December 17, 1950, your petitioner prays that he may be found to be the first, original, and sole inventor of the inventions described in said Letters Patent Nos. 1,173,879, 1,173,880, and 1,229,152, and each of them; that he may be found to be justly entitled to receive from the defendant, as compensation for the use of his said patented inventions, or any of them, since the date of said Letters Patent, up to the time of adjudication, the sum of four million ($4,000,000) dollars; and your petitioner prays judgment in his favor against the United States for the sum of four million ($4,000,000) dollars; and for such other and further relief as to this honorable Court may seem just.

David McD. Shearer,
By C. C. Calhoun,
Attorney of Record.

Melville Church,
C. B. Des Jardins,
National Press Building, Washington, D. C.
Attorneys and of Counsel for Petitioner.

12 [*Duly sworn to by C. C. Calhoun, jurat omitted in printing.*

13 *Exhibit "A" to petition*
14

D. McD. SHEARER.
REVETMENT.
APPLICATION FILED DEC 30, 1914.

1,173,879. Patented Feb. 29, 1916.
3 SHEETS—SHEET 1.

Fig 1.

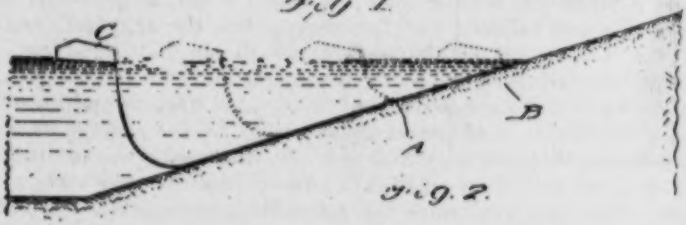
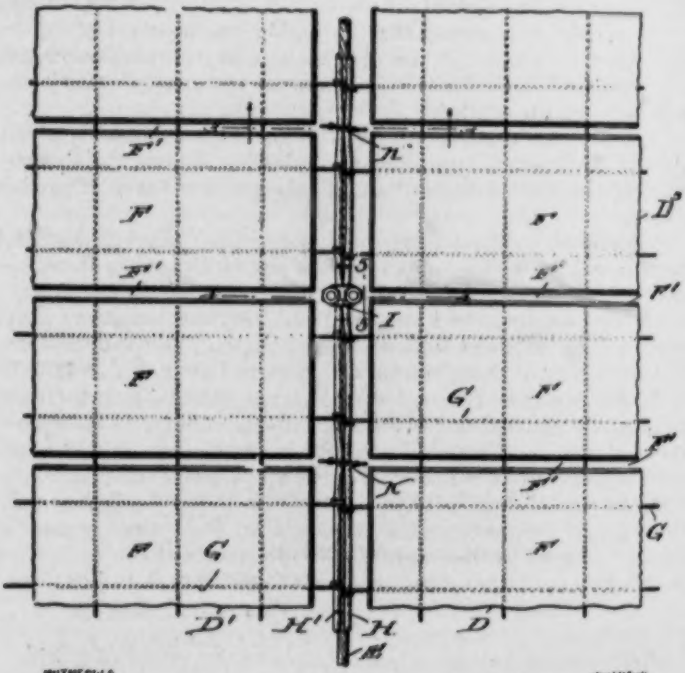


Fig. 2.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D. McD. SHEARER.

REVETMENT.

APPLICATION FILED DEC. 30, 1914.

1,173,879.

Patented Feb. 29, 1916.

3 SHEETS—SHEET 2.

Fig. 3.

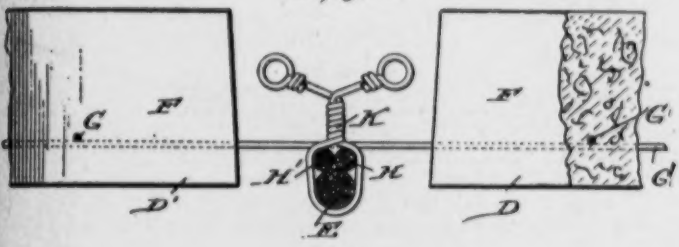


Fig. 4.

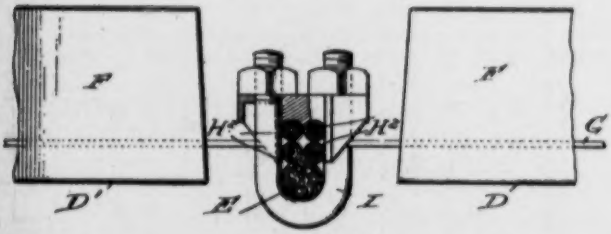
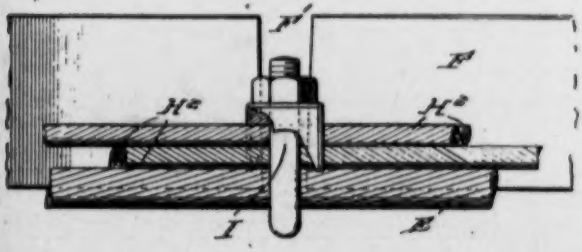


Fig. 5.



WITNESSES

H. C. Barry

Myron Clark

INVENTOR

David M. Shearer

BY Munn & Co.

D. McD. SHEARER.

REVETMENT.

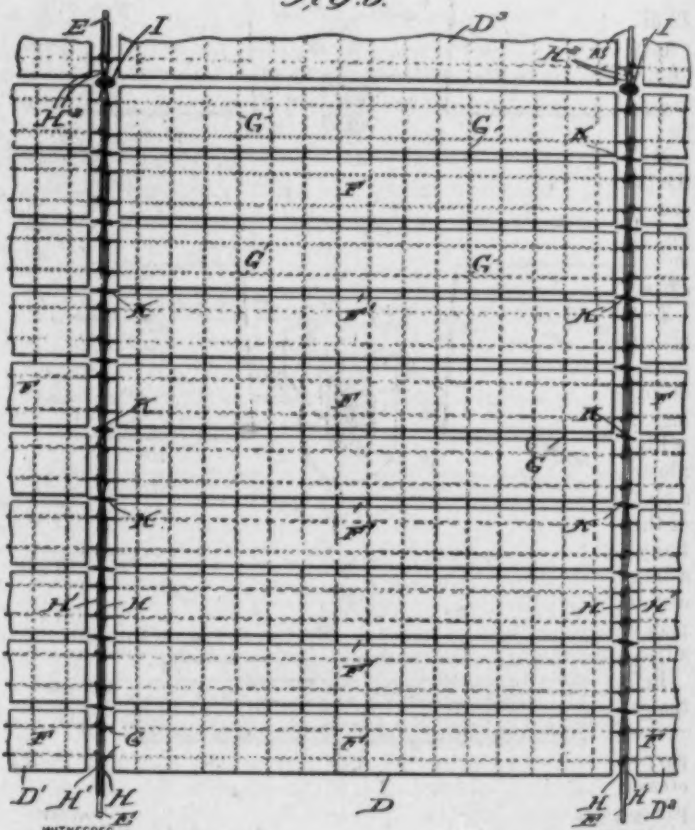
APPLICATION FILED DEC. 30, 1914.

1,173,879.

Patented Feb. 29, 1916.

3 SHEETS—SHEET 3.

Fig. 6.



WITNESSES

J. C. Barry

Wm. Bliss.

INVENTOR

David M. Shearer

BY Munn & Co.

ATTORNEYS

19 UNITED STATES PATENT OFFICE

David McDougald Shearer, of Greenville, Mississippi

REVETMENT

1,173,879. Specification of Letters Patent. Patented Feb. 29, 1916. Application filed December 30, 1914. Serial No. 879,644.

To all whom it may concern:

Be it known that I, DAVID McD. SHEARER, a citizen of the United States, and a resident of Greenville, in the county of Washington and State of Mississippi, have invented an Improvement in Revetments, of which the following is a specification.

My present invention relates generally to revetment mats for the protection of subaqueous river banks and shores from current and wave erosion and to promote soil stability, and the object thereof is to provide a practical, economical structure of mat, the units of which are of concrete, whereby it may be placed in strong currents and in great depths of water.

To this end my invention resides in the main in the connections both between the units themselves and between groups of such units, which connections will clearly appear from the following description, in which reference is made to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a sectional elevation, diagrammatic in its nature, illustrating the general manner in which the mat is laid. Fig. 2 is a plan view on an enlarged scale, of a portion of adjacent sections of the mat. Fig. 3 is a transverse vertical section taken substantially on line 3—3 of Fig. 2. Fig. 4 is a similar view taken substantially on line 4—4 of Fig. 2. Fig. 5 is a vertical longitudinal section taken substantially on line 5—5 of Fig. 2, and Fig. 6 is a plan view of one complete section and the side and end portions of adjacent sections, on a substantially reduced scale.

Referring now to these figures and more particularly to Fig. 1, the general nature of my invention may be better understood by reference to the continuous mat A placed along the subaqueous portion of a blank B to protect the latter against current and wave erosion, and the flexible nature of which may be inferred by comparison of the full and dotted line positions of portions of the mat in the course of laying the same. The placement of this mat is accomplished by launching the same from a suitable device C shown in full lines in Fig. 1 at substantially the position of casting off of the mat and shown in dotted lines in the same figure at various points more or less removed from the bank or shore B as the mat A is fabricated and lowered into position.

The mat A consists of a plurality of sections D, D′ and D², of which the section D is shown complete in Fig. 6, connected along its sides and ends in accordance with my invention to the adjacent sections D′, D², and D³, such connections including heavy cables E, which I will hereinafter refer to as launching strands, whereby to form elements continuous longitudinally through the entire mat, capable of passage over sheaves or rollers upon the launching device C and of supporting the entire mat in the course of launching in order to relieve the concrete units and the mat sections themselves from breaking strain. By means of such launching strands, the several sections of the mat may be readily fabricated together upon a suitable launching boat having sheaves or rollers over which the continuous launching strands pass, and the mat thereby lowered in step by step movements as the sections thereof are successively joined thereto.

In accordance with my invention, therefore, each of the sections of the mat consists of a plurality of concrete units F which are cast over crossed longitudinal and transverse bonding wires G extending continuous through the several block units of the section, the transverse wires having their ends projecting beyond the ends of the said block units along opposite sides of the section in order to provide for the connection of the ends of these bonding wires to border strands H, and H′ which border strands may be in the form of small cables which extend along the section side and have their ends lapped upon the adjacent ends of the next sections, and which lapped ends are connected by bolted clips I, which also serve to hold them in connection with the launching strand E as best seen by reference to Fig. 4, in which the lapping ends of the border strands of two adjacent sections are indicated at H².

By reference to Fig. 2 it will be noted that the projecting ends of the transverse bonding wires G are preferably coiled and welded around the border strands H and H′, the former of section D and the latter of section D′ and it will also be seen that the several block units F of each of the sections are spaced apart and have their edges beveled so that in form they are substantially frusto pyramidal, permitting considerable flexure, particularly in a downward direction, at the spacing points F′ between the blocks, which I will hereinafter refer to as flexure joints. It will also be seen that in addition to the connection of lapping ends of the border strands H and H′ together and to the launching strands E, by means of the bolted clips I, and which clips may be utilized at any other points along the connections found either desirable or necessary, I utilize Curry ties and the like K connecting the strands E, H and H′ particularly at or opposite the flexure joints F′. These Curry ties K′ which may be used at any other points found desirable or necessary, and one of which is plainly

shown in Fig. 3, are sections of wire twisted around the strands mentioned.

From the structure of the mat thus described it will be seen that due to the spaces between the several sections D, D′, D² and others, and the launching strand E extending through such spaces, the sections may be fabricated together upon the launching boat or device C and lowered therefrom and into position by means of the launching strands over sheaves or pulleys without strain upon the several sections or the block units thereof.

A mat so constructed is not only economical of itself but is capable of being economically laid and is highly practicable for the purposes for which it is intended either in strong currents or great depths. My revetment as thus described is, furthermore, particularly adapted for difficult subaqueous application. Generally speaking, gravel concrete will be used of suitable proportions of cement, river gravel, and sand, and it is planned to cast the revetment in sections of the width of a suitable wire fabric and of a length suitable for a group of men to handle. Special forms will be used to span the wire mesh, and to hold it in place and flexure joints between the unit blocks, also to leave exposed the border of the wire fabric for handling and for fastening means. The forms utilized are in unit sections of convenient size, so that the length of the mat sections may be increased as desired by the continuous addition of unit forms. When the first casting or in other words, the first section has cured sufficiently, a layer of greased paper is spread over it for a new surface and to prevent adhesion, and the casting operation is repeated, superimposing one section over another, and thereby loading the deck of a barge used for the purpose, with sections of mats ready to be transported to the site of ultimate use and there fabricated into the revetment directly from the position where cast on the barge, and thus with a minimum amount of labor in rehandling. My revetment, furthermore, possesses the additional advantage of being fabricated entirely above the water and then lowered into place for use. The sections may be cast at the site of supply of the raw material, viz., the gravel, sand, and cement, under suitable weather conditions, and reserved for future use, or transported to the site of fabrication and use, all without handling the sections of mats from the time when cast, to the time of fabrication into the complete revetment.

I claim:—

1. A revetment mat consisting of a plurality of sections spaced apart to form longitudinal channels throughout the mat and having exposed bordered strands, launching strands extending between the several sections parallel with and in spaced relation thereto within said channels, and connections between the launch-

ing strands and the adjacent portions of the border strands, substantially for the purpose set forth.

2. A revetment mat consisting of a plurality of sections spaced apart to form longitudinal channels throughout the mat, each of which sections comprises a plurality of flexibly united block units and has exposed and flexible border strands at its sides, launching strands extending between the several sections thus formed parallel with and in spaced relation thereto within said channels, and connecting members for uniting the border strands at the sides of the sections to the said launching strands extending therebetween.

3. A revetment mat consisting of a plurality of sections having exposed border strands by which they may be connected to one another, connections for uniting the border strands of adjacent sections, each of the sections consisting of a plurality of similarly spaced and flexibly connected block units and a plurality of bonding members extending continuously through the blocks throughout the section whereby to flexibly connect the blocks thereof, the said bonding wires projecting beyond the sides of the section and connected to the said border strands, and continuous launching strands extending between the several sections in one direction and connected rigidly to the border strands thereof.

4. A revetment mat consisting of a plurality of sections having exposed border strands whereby they may be connected to one another in spaced relation, continuous longitudinal launching strands extending between the sections, each section consisting of a plurality of spaced flexibly connected block units, the spaces between which constitute flexure joints at right angles to the spaces between the sections in which the launching strands are disposed, and connections between the launching strands and the border strands at the sides of the sections, certain of which connections are arranged opposite the said flexure joints.

21 5. A revertment mat consisting of a plurality of sections having exposed border strands whereby they may be connected to one another in spaced relation, continuous longitudinal launching strands extending between the sections, each section consisting of a plurality of spaced flexibly connected block units, the spaces between which constitute flexure joints at right angles to the spaces between the sections in which the launching strands are disposed, the ends of the border strands being lapped along the launching strands, clips for connecting the said lapped ends of the border strands to the launching strands, and tie wires connecting the launching and border strands at points opposite the said flexure joints.

6. A revertment mat including a plurality of sections spaced apart to form parallel longitudinal channels, each of said sections

including a series of uniform blocks of plastic material, and a continuous bonding wire fabric extending through the several blocks and reinforcing and inseparably connecting the blocks in spaced relation, the borders of two sides of the said fabric, in the direction at right angles to the longest dimension of said block, being exposed whereby to provide means for handling and connecting the several sections, and parallel launching strands extending between the said sections, and continuous throughout the mat within said channels, said launching strands being connected to the exposed borders of the wire fabric of adjacent sections whereby to connect the sections in contiguous spaced relation and form a flexible structure of revetment mat.

7. A revetment mat including a plurality of sections, each of which sections constitutes a unit of construction, and consists of a plurality of uniformly spaced oblong blocks formed of plastic material, and a continuous wire fabric over which the several blocks are formed, the fabric extending through the several blocks of the sections and the spaces therebetween and joining the same flexibly and inseparably in spaced relation, and two edges of said fabric being exposed along two sides of the sections in directions at right angles to the longitudinal axis of the blocks forming the sections, whereby to provide for handling and connecting the several sections.

DAVID McDOUGALD SHEARER.

Witnesses:
WM. McC. CHILDS,
V. P. JOHNSON.

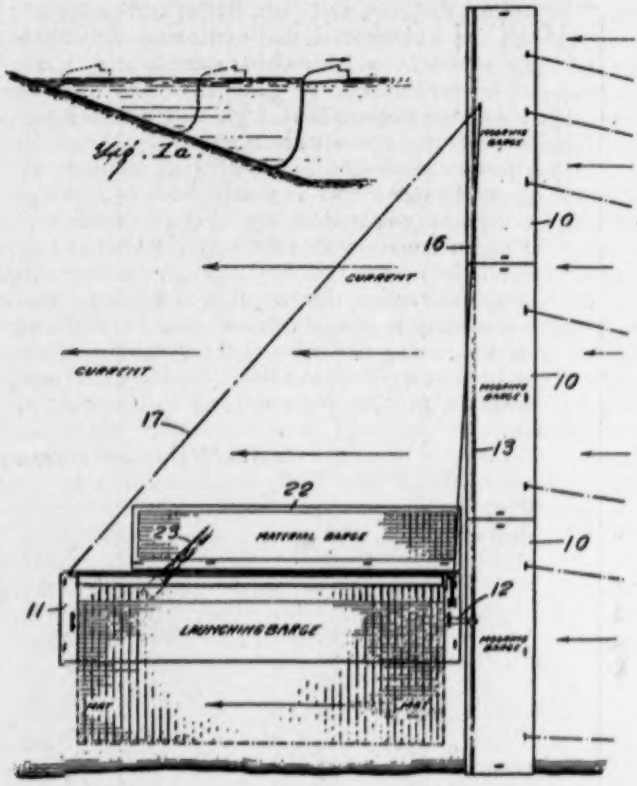
Exhibit "B" to petition
Shearer patent 1173,880
follows page 102 herein

29 *Exhibit "C" to petition*
30

D. McD. SHEARER.
APPARATUS FOR LAUNCHING REVETMENT MATS.
APPLICATION FILED OCT. 6, 1915.

1,229,152. Patented June 5, 1917.

3 SHEETS—SHEET 1.



WITNESSES:

Fig. I.

INVENTOR
DAVID McD. SHEARER,
BY Munn & Co.
ATTORNEYS

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D. McD. SHEARER.

APPARATUS FOR LAUNCHING REVETMENT MATS.

APPLICATION FILED OCT. 6, 1915.

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5 SHEETS—SHEET 2.

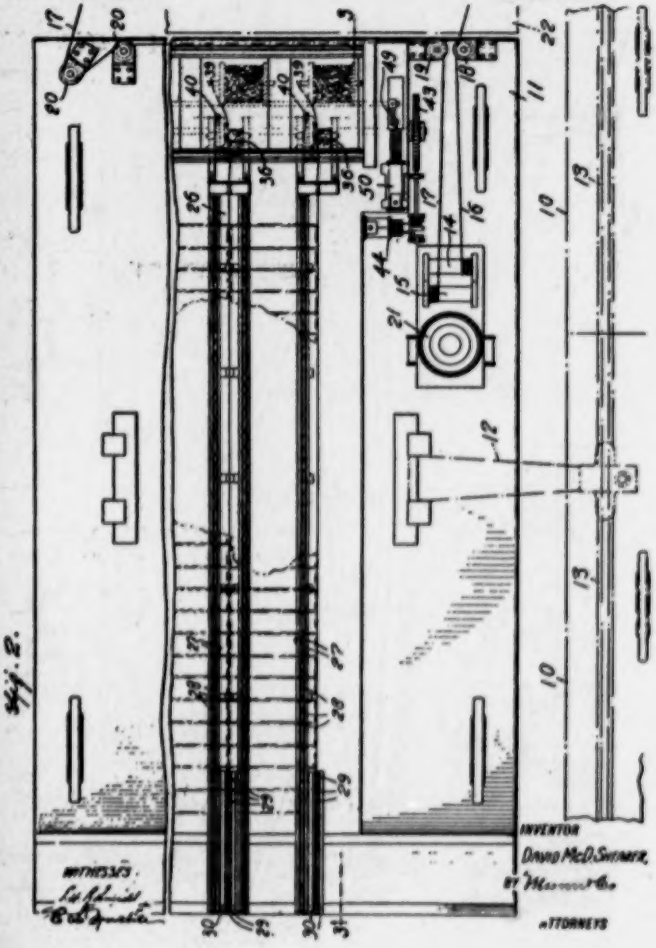

Fig. 2.

D. McD. SHEARER.

APPARATUS FOR LAUNCHING REVETMENT MATS.

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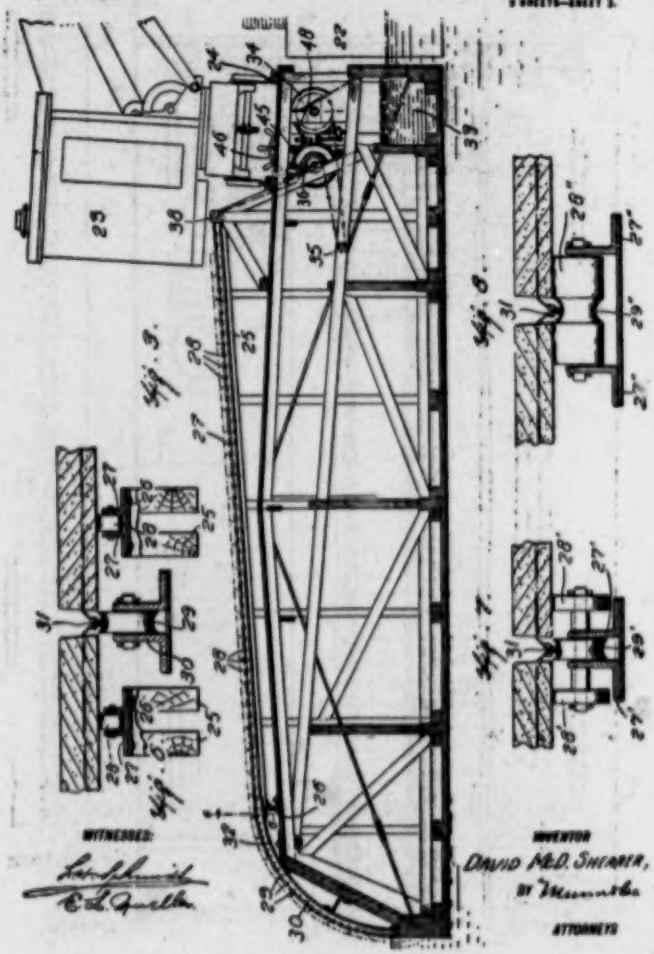
1,229,152. Patented June 5, 1917.

3 SHEETS—SHEET 3.



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D. McD. SHEARER.

APPARATUS FOR LAUNCHING REVETMENT MATS.

APPLICATION FILED OCT. 6, 1913.

1,229,152. Patented June 5, 1917.

3 SHEETS—SHEET 4.

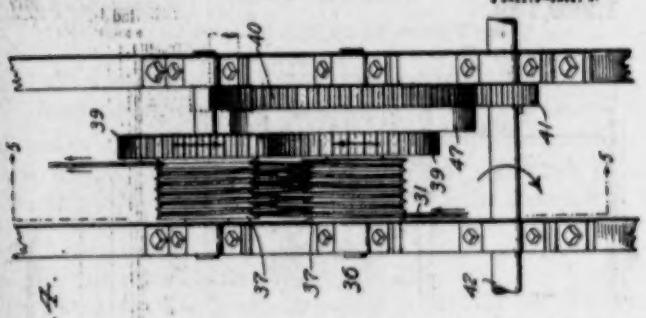


Fig. 4.

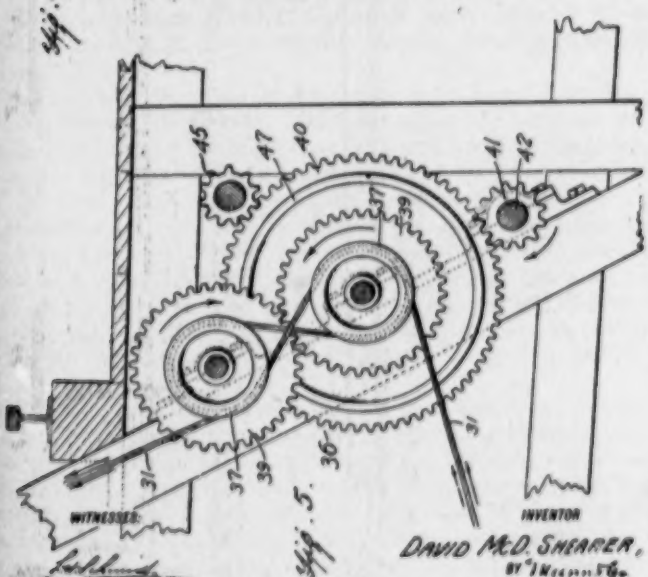


Fig. 5.

WITNESSES:

E. L. Moeller

INVENTOR

DAVID McD. SHEARER,

BY [illegible] & CO.

ATTORNEYS

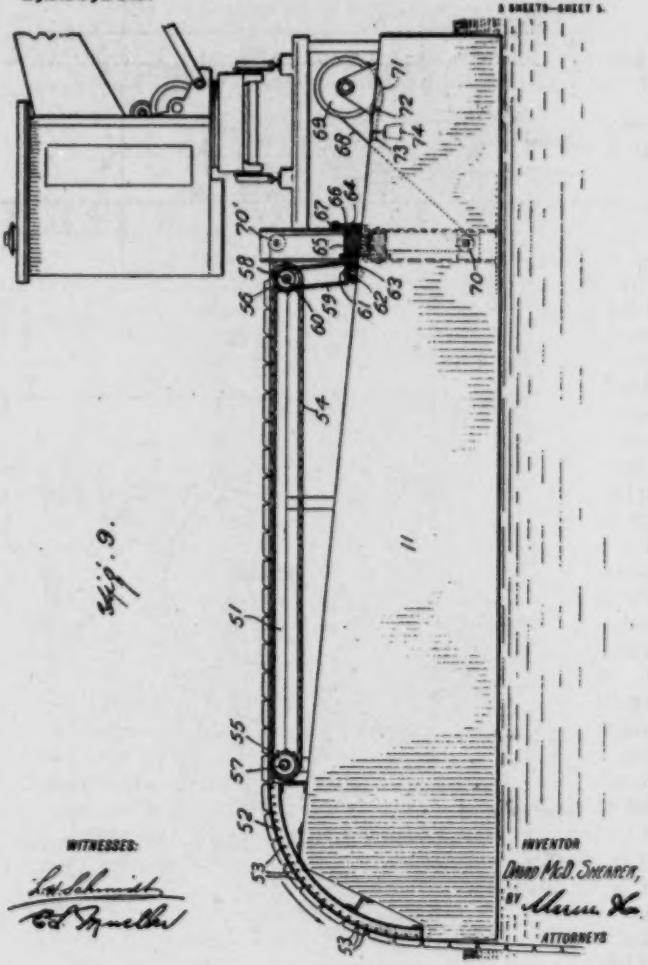
D. McD. SHEARER.

APPARATUS FOR LAUNCHING REVETMENT MATS.

APPLICATION FILED OCT. 6, 1915.

1,229,152. Patented June 5, 1917.

5 SHEETS—SHEET 5.



39 UNITED STATES PATENT OFFICE

David McDougald Shearer, of Vicksburg, Mississippi

APPARATUS FOR LAUNCHING REVETMENT-MATS

1,229,152. Specification of Letters Patent. Patented June 5, 1917. Application filed October 6, 1915. Serial No. 54,461.

To all whom it may concern:

Be it known that I, DAVID McD. SHEARER, a citizen of the United States, and a resident of Vicksburg, in the county of Warren and State of Mississippi, have made certain new and useful Improvements in Apparatus for Launching Revetment-Mats, of which the following is a specification.

This invention is an improvement in apparatus for launching and laying revetment mats, and is particularly adapted for use in connection with my copending application, bearing Serial No. 879,644.

Briefly stated, the invention consists in providing a plurality of mooring barges, preferably arranged across the current of a stream or river, and having connected thereto a launching barge or barges each carrying a mechanism of novel construction adapted to feed the revetment mats therefrom. This launching barge is arranged as nearly parallel to the shore line as possible, and at substantially right angles to the mooring barges, and has associated therewith a material barge loaded with a series of relatively small superimposed unit mats, which are adapted to be transferred to the launching barge by a suitable crane mechanism carried by the latter, and fabricated into the final structure of mat.

An object of the invention is to provide a mat barge having a plurality of inclined ways consisting of a series of rollers adapted to support a mat and guide the same, the delivery end of said ways terminating in a downwardly curved launching frame, from which the mat passes into the water. But it is to be understood that conveyor chains, cables, or belts may be substituted for or used in connection with said rollers, as circumstances may warrant, to facilitate launching of the mat from the ways.

Another object is to provide a series of supply drums on the launching barge upon each of which is wound a cable adapted to pass between and to be secured to adjacent rows of concrete slabs or blocks constituting the mat, and be fed from said drums by suitable means including a power controlled friction device adapted to prevent the too rapid launching of said mat, which would otherwise result from the heavy drag or pull occasioned by the weight of that portion of the mat already launched.

A further object is the provision of a suitable means preferably carried by the launching barge and connected to one of the mooring barges for moving the former outwardly toward the channel of the river as the mat is being paid off into the water, a bar also being associated with said barges and engaged by said means for guiding the launching barge during said outward movement.

The inventive idea involved is capable of receiving a variety of mechanical expressions, some of which, for the purpose of illustrating the invention, are shown in the accompanying drawings, but it is to be expressly understood that said drawings are used merely to facilitate the description of the invention as a whole, and not to define the limits thereof, reference being had to the appended claims for this purpose.

In the drawings:—

Figure 1 is a diagrammatical illustration of the entire apparatus showing the relative positions of the different barges in a body of water when a mat is being launched.

Fig. 1' is a diagrammatic elevation of the launching or mat barge showing the manner in which the mat is laid.

Fig. 2 is a fragmentary top plan view of the mat or launching barge.

Fig. 3 is a vertical transverse section of said barge on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged edge elevation of the friction device employed in connection with the other mechanism for launching the mats.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 3 of one embodiment for supporting and guiding the mat on the launching barge.

Fig. 7 is a similar view showing another modification, and

Fig. 8 is a view showing a still further modification.

Fig. 9 is a side elevation of another form of mechanism for launching the mat.

Referring more particularly to the drawings, the numeral 10 indicates a series of mooring barges, which are preferably arranged end to end, and cross the current of the river, said barges being anchored or moored in any preferred manner.

A launching barge, generally indicated by 11, is associated with said mooring barges, and arranged at substantially right angles thereto and parallel to the shore line. A traveler 12 is carried by the end of the launching barge 11 adjacent the mooring barges, and is adapted to engage a single track 13 carried by the latter barges for the purpose of guiding said launching barge when the same is moved outwardly toward the channel of the river as the mat is being delivered therefrom. It

is to be understood that two or more of these launching barges may be employed in which case they are arranged end to end.

An apparatus is employed for controlling said outward movement and includes independent drums 14 and 15 or power capstans upon which are mounted cables 16 and 17, respectively. The cable 16 extends directly to the outer end of the outermost mooring barge, and is secured thereto, the same passing over a pulley 18 provided on the launching barge 11. The cable 17 likewise passes over a pulley 19 adjacent pulley 18 and then extends along the edge of the launching barge to pulleys 20, after which said cable is extended to the outermost mooring barge where the same is secured thereto.

By operating a power unit generally illustrated at 21, the cables 16 and 17 may be wound upon their respective drums, and the barge moved outward into the river as the mat is being delivered therefrom and held parallel to the current.

A material barge 22 is secured to the outer longitudinal side of the launching barge and is adapted to have superimposed sections of the mats loaded or cast thereon. These unit sections of the mat are adapted to be transferred from the material barge to the launching barge and there joined into the structure of the mat as the laying of the mat progresses, and for this purpose there is provided a traveling crane generally indicated by 23, and mounted on tracks 24 extending longitudinally of the launching barge along the edge adjacent the material barge.

The launching barge 11 may be of any preferred construction and has mounted above its upper deck the supports 25 of the launching ways 27 which are inclined transversely of the barge and have their lowermost portions adjacent the delivery edge thereof, as best illustrated in Fig. 3. In the modification shown in Fig. 6 these ways include angle irons 27 between which are journaled rollers 28 for supporting the adjacent portions of the mat. These ways preferably extend over the downwardly curved edge of the barge, as shown in Fig. 2. The gunwale of the barge 11 along the delivery edge thereof has mounted thereon a plurality of arcuate sheave supporting frames 32, there being two ways 26 for each frame. Each of these frames has journaled therein a plurality of sheaves 29 the bearing surfaces of which have the same radius as that of the rollers 28 mounted on the curved extremity of the ways.

In the embodiment shown in Fig. 7 the arcuate frame 27′ consists of a pair of angle irons in which is journaled a stub shaft upon the ends of which are mounted rollers 28′ which form the ways, a sheave 29′ being mounted between said angle irons. In the further embodiment illustrated in Fig. 8 the supporting and guiding means consists of a single roller 28″ having an annular

groove 29'' intermediate its ends and adapted to receive the cable 31, said roller being journaled in the frame 27''. These sheaves extend only from the upper terminus of the frames to the lowermost portions thereof where the mat enters the water. They are also arranged as closely together as possible so that the effect of a perfect curve may be secured as nearly as consistent.

As the mat travels down the inclined ways 25 the same passes upon the rollers and sheaves of the frames 32 and is guided from thence off into the water, as shown in Fig. 3. It is to be understood that before that portion of the mat on the inclined ways is launched, the free edges of the constituent units of the fabrication in said portion of mat are tied to the cables 31 thus forming a continuous structure of mat. The barge 11 may be provided with a ballast tank 33 in order to counteract the weight of the mat as the same is being placed in very deep water.

Means are provided in connection with each of the cables 31 to prevent the rapid launching of the mat from the barge which would be occasioned by the drag or pull exerted by that portion of said mat, which has already been launched. For this purpose each of the cables 31 is originally wound upon a separate drum 34 which may be the original commercial reels on which the cable or strand has been purchased, journaled in the framework of the barge 11, as shown in Fig. 3, said cable leading from said drum over a pulley 35, also journaled in the framework of the barge, and from thence, following the direction of the arrows, to the friction device generally indicated by 36 and best illustrated in Figs. 4 and 5. This friction device includes a pair of grooved friction sheaves 37 over which the cable 31 is adapted to pass back and forth several times, as shown in Fig. 4 in order to secure the required amount of frictional resistance. The cable then follows the direction of the arrows in Fig. 4 and passes upwardly to the inclined ways 25 and thence over a pulley 38 and between said ways. Journaled and keyed upon the same shaft with the sheaves 37 are the gear wheels 39 which form a portion of a train of gearing for operating said sheaves in unison to cause the cable to be gradually fed from the drums 34. The large gearing wheel 40 is also associated with the smaller gears 39, and said gear 40 is in turn driven by a small gear 41 detachably keyed upon the drive shaft 42. This drive shaft is operated by a gear 43 mounted upon one end thereof and driven by a suitable source of power 44 mounted upon the barge. It is to be understood that this shaft 42 extends the entire length of the barge so that the same will operate all of the devices 36 simultaneously. If desired, these devices may be operated separately by throwing the small gear 41 out of mesh with the large gear 40, whereupon a small gear 45, shown in Fig. 3, may be thrown into mesh with

the gear 40 and operated by a detachable handwheel 46. In this manner each of the devices 36 may be individually actuated and, when not in use the hand-wheel may be dismounted.

Interposed between one of the gears 39 and gear 40 is a brake flange 47 over which is passed a brake band 48, the latter being in conjunction with another band also mounted over a similar brake flange formed upon the drum or reel 34. Means are provided for adjusting the tension of this brake band against the flanges, and consists of a crank shaft 49 connected to said brake band and operated by a steam cylinder 50 carried by the barge 11. This crank shaft is so mounted that the greater braking power may be exerted on the flange 47 and the lesser amount on the flange of the reel or drum. It is to be understood that an average amount of braking power is applied to these flanges at all times so that the cable 31 will not be unwound from its respective drum too rapidly. This mechanism, including the brake band 48, operated by the power unit 50, is preferably used merely as an emergency check whenever desired and as a means by which the drum 34 and the mechanism illustrated in Figs. 4 and 5 may be operated against frictional restraint.

From the foregoing description it will be seen that the operation of laying a revetment mat consists in first arranging the different barges as illustrated in Fig. 1, with the launching barge close to the shore. A layer of concrete slabs or concrete mat units of construction is then transferred from the carrier material barge by the crane 23 to the inclined ways 26, where the different slabs or unit sections of mat are joined to the cables 31. The mechanism for drawing the barge outwardly toward the channel of the river and which includes the cables 16 and 17 is then operated, whereupon the portion of the mat upon the launching barge will gradually be fed therefrom, on operation, at the same time, of power unit 44 which completely controls the launching of the mat from the ways.

As the mat is being launched the cable feeding and friction device 36 causes the cables to be slowly unwound from the drums 34. When the section of the mat being laid is of sufficient length, the cables 31 may be severed. The entire apparatus is then shifted to another position downstream a distance substantially equal to the width of the mat, it being preferably located so that the adjacent edge of the next succeeding section to be laid will overlap that of the preceding one. During the entire process of laying the mat, the weight of the suspended portion is entirely supported by the cables 31 which pass over the different sheaves 29 mounted in frames 32, which fact avoids injury to that portion of said mat on the launching ways.

In the construction shown in Fig. 9 the barge 11 has a flat superstructure 51 in contradistinction to the inclined supports 25 as shown in Fig. 3. The delivery edge of the barge is provided with arcuate sheave supporting frames 52 similar in construction to the frames 32, and said frames 52 have mounted therein sheaves 53. The rollers 28 employed in the embodiment shown in Fig. 3 are replaced, in Fig. 9, by an endless conveyer chain 54 mounted upon sprockets 55 and 56 carried by the shafts 57 and 58, respectively, which extend longitudinally of the barge. These conveyer chains 54 are arranged at intervals along the barge and support and convey the mat to the delivery end of said barge. The shafts 57 and 58 are operated by means of a drive chain 59 mounted upon a spocket wheel 60 carried by said shaft 58 and also a similar sprocket wheel 61 associated with the bevel gear 62. Another bevel gear 63 meshes with the gear 62 and is geared by a shaft 64 which extends through the friction brake device 65 which is similar in construction to the brake device 36 shown in Figs. 4 and 5. This shaft 64 has mounted thereon a gear wheel 66 which meshes with a worm shaft 67 connected to the source of power 44 shown in Fig. 2 of the drawing. It will thus be seen that the operation of the shaft 67 will drive the conveyer chains 54 to launch the mat from the barge and also pay any cable 68 at the same rate of speed.

Cables 68, similar to the cables 31, are also employed and are mounted upon supply drums 69 from which the same are passed around the pulleys 70 and from thence to the brake devices 65 which prevent the rapid launching of the mat from the barge, said cables 68 passing over a pulley 70′ and being arranged to the mat as previously described. In addition to the brake devices 65, there is shown in Fig. 9 another brake device associated with the
42 drum 69 and including a shoe 71 pivoted at 72 and having an arm 73 extending on the other side of said pivot to which is connected a weight 74 which causes a frictional engagement of the shoe 71 against the drum 69 and thereby prevents the cable from unwinding too rapidly from said drum, thus furnishing the initial restraint necessary to insure proper functioning of the cable controlling mechanism 65 in developing the required degree of friction with cable 68.

I claim:—

1. An apparatus for laying revetment mats comprising a plurality of mooring barges, a launching barge connected thereto, a material barge associated with said launching barge, means for transferring the mats from the material barge to said launching

barge, means for controlling delivery of said mat from said launching barge, and means for moving said launching barge longitudinally of said mooring barges as the mat is being launched.

2. An apparatus for laying revetment mats comprising a plurality of mooring barges, a launching barge connected thereto, a material barge associated with said launching barge, means for transferring the mats from the material barge to said launching barge, means for controlling delivery of said mat from said launching barge, means for moving said launching barge longitudinally of said mooring barges, as the mat is being launched, and means for guiding said launching barge during its longitudinal movement.

3. An apparatus for laying revetment mats, comprising a plurality of mooring barges arranged transversely of the current or stream, a launching barge movable longitudinally of said mooring barges and in substantially parallel relation to the shore line, and means for launching the unit mats from said launching barge.

4. An apparatus for laying revetment mats, comprising a plurality of mooring barges arranged transversely of the current or stream, a launching barge movable longitudinally of said mooring barges and in substantially parallel relation to the shore line, means for launching the unit mats from said launching barge, and means including flexible members connecting said launching barge with one of said mooring barges for moving the former outwardly from the shore as the laying of the mat progresses.

5. An apparatus for laying revetment mats, comprising a plurality of mooring barges arranged transversely of the current or stream, a launching barge movable longitudinally of said mooring barges and in substantially parallel relation to the shore line, means for launching the unit mats from said launching barge, and a material barge from which the unit mats are transferred to said launching barge.

6. A launching barge for revetment mats comprising launching ways terminating at the delivery ends in downwardly curved inclines, sheaves supporting frames associated with said curved portions, sheaves mounted in said frames in close proximity to each other, cable carrying devices mounted in said barge, launching cables carried by said devices and to which the mats are to be secured at opposite sides, mechanism for moving the barge to feed the mat therefrom, a friction device associated with each of said cable carrying devices and including friction sheaves over which said cable passes, and an adjustable brake band for controlling the speed with which the cable is fed from said devices.

7. In an apparatus for laying revetment mats, a barge having transversely extending inclined ways, and sheaves between the ways, a cable carrying drum mounted on the barge, guides between the drum and the inclined ways, a launching cable to which mats are to be secured at opposite sides, said cable passing from the drum over the guides between the way and over the sheaves, and means for feeding the cable from the drum.

8. In an apparatus for laying revetment mats, a barge having transversely extending roller ways and sheaves between the rollers, a cable carrying drum mounted on the barge, a friction device on the barge adjacent the drum, a launching cable to which mats are to be secured at opposite sides, said cable passing from the drum to the friction device and from said friction device over the sheaves between the ways, and means for operating the friction device to feed the cable and mats from the barge.

9. In an apparatus for laying revetment mats, a barge having transversely extending ways, sheaves between the ways, a cable carrying drum mounted on the barge, a pair of friction sheaves geared together, a launching cable leading from the drum, over and around the friction sheaves and from said sheaves to and over the sheaves between the said ways and to which mats are to be secured at opposite sides, and means for operating the friction sheaves to feed the cable from the drum.

DAVID McDOUGALD SHEARER.

Witnesses:
W. P. HIDER,
W. D. NOBLE.

43 *General traverse*

Filed June 12, 1933

And now comes the Attorney General, on behalf of the United States, and answering the petition of the claimant herein, denies each and every allegation therein contained; and asks judgment that the petition be dismissed.

W. W. SCOTT,
Acting Head, Court of Claims Division.

JFM.

Argument and submission of case

On December 7, 1937, the argument of case on merits begun by Mr. C. B. DesJardins for plaintiff, and by Mr. Clifton V. Edwards for defendant.

On December 8, 1937, the argument on merits concluded and case submitted by Mr. Clifton V. Edwards for defendant, and by Mr. C. B. DesJardins for plaintiff.

45 *Special findings of fact, conclusion of law and opinion of the court by Chief Justice Booth*

Filed March 7, 1938

Mr. C. B. Des Jardins for the plaintiff, Messrs. C. C. Calhoun and Halbert P. Brown were on the briefs.

Mr. Clifton V. Edwards, with whom was Mr. Assistant Attorney General Sam E. Whitaker, for the defendant. Mr. J. F. Mothershead was on the brief.

This case having been heard by the Court of Claims, the court upon the report of a Commissioner and the evidence makes the following

Special findings of fact

1. This suit is brought by David McDougald Shearer, a citizen of the United States, for alleged infringement of three United States letters patent to him, numbers 1173879 and 1173880, patented February 29, 1916, on applications filed December 30, 1914, and August 20, 1915, respectively, and letters patent number 1229152, patented June 5, 1917, on an application filed October 6, 1915. Copies of these patents are in evidence as plaintiff's exhibits 2, 3, and 4, respectively. These exhibits and all other exhibits referred to in these findings are made a part hereof by reference.

2. A special act of Congress (Private, No. 285, 71st Congress) was enacted by the 71st Congress and approved by the President on December 17, 1930. The act reads as follows:

"Be it enacted by the Senate and House of Representa-
46 tives of the United States of America in Congress assembled, That the claim of David McD. Shearer for compensation for the use by the Government of the United States of certain inventions relating to reinforced concrete revetment and construction and laying of same, made by said David McD. Shearer, and for which letters patent of the United States numbered 1173879, 1173880, and 1229152 were issued to him, be, and the same is hereby, referred to the Court of Claims, which court is hereby vested with jurisdiction in the premises, and whose duty it shall be to hear and determine any statute limiting the time within which such an action may be brought to the contrary notwithstanding, first, whether the said David McD. Shearer was the first, original, and sole inventor of the inventions described in

said letters patent or any of them; and if said court shall find that he was such first, original, and sole inventor of any of the same, then to determine, second, what amount of compensation, if any, he is justly entitled to receive from the United States for the use of his said inventions or any of them, since the date of said letters patent, up to the time of adjudication. In determining whether or not said David McD. Shearer is entitled to compensation and the amount of compensation, if any, for the use of said inventions the court shall take into consideration, if and so far as the facts may warrant, the facts, if proved, that while said David McD. Shearer was engaged in perfecting the invention he was in the service of the United States as a junior engineer superintendent in charge of willow bank revetment construction under the Mississippi River Commission, and whether and, if at all, to what extent said inventions or any of them were discovered or developed during the working hours of his Government service, and to what extent his said inventions for protection of river channels and banks differ from the methods previously used, in material, method of laying, permanency and value, and, whether if at all to what extent the expense of making experiments, trials, and tests for the purpose of perfecting said inventions was paid by the United States, and if any such expense was incurred by the United States, whether and, if at all, to what extent the United States received compensation for such expense.

"Either party may appeal to the Supreme Court of the United States upon any such question where appeals now lie in other cases, arising during the progress of the hearing of said claim, and from any judgment in said case, at any time within ninety days after the rendition thereof; and any judgment rendered in
47 favor of the claimant shall be paid in the same manner as other judgments of said Court of Claims."

Approved, December 17, 1930.

A copy of said act is in evidence as plaintiff's exhibit 1. Plaintiff is the party named in the act, is the sole owner of the patents in suit, and has never voluntarily licensed the defendant under any of the patents in suit.

3. The question of the amount of recovery, if any, is reserved until after determination by this Court of the question of liability.

4. The patents relate generally to structures intended to cover and protect the banks of rivers against erosion by the water. Such structures are termed revetments, and are customarily sunk in the river over the subaqueous banks and extend some distance out into the river and also up and down the bank in the direction of flow, over the section of the bank it is desired to protect.

Patent No. 1173879

5. Patent No. 1173879 relates to revetment structure, and Fig. 6 thereof reproduced on page 4 is a plan view of the patented revetment structure, showing one complete section and the side and end portion of adjacent sections. The patent discloses a revetment mat formed of a multiplicity of concrete slabs F, the length of each slab being much greater than its width, a number of such spaced apart slabs being flexibly joined together in a section D, with their longer dimensions adjacent, by being cast over a fabric or mesh of reinforcing wires G. The outside or "border" strands H and H' attached to the reinforcing fabric are not embedded in the concrete, but are left exposed on opposite sides of the sections.

In placing the revetment in position, a number of such sections D, D', and D' are joined side by side, with the shorter sides of the slabs adjacent, but spaced apart, thus forming continuous longitudinal spaced channels between the sections.

Extending through these channels are placed strong cables E termed "launching cables" or "launching strands," and the border strands and launching cables are fastened together at intervals by bolted clips or "Curry ties." The adjacent ends of the
48 border strands may be lapped and the individual slabs may have their edges beveled to facilitate flexure of the assembled mat.

The structure thus described may be assembled upon a barge and passed over the side over sheaves or rollers, additional sections being attached as the mat is paid out over the launching ways, and the launching barge being moved along as the mat is paid out, the launching cables being capable "of supporting the entire mat in the course of launching in order to relieve the concrete units and the mat sections themselves from breaking strain."
49 The patent states that such a mat "is not only economical of itself but capable of being economically laid and is highly practical for the purposes for which it is intended either in strong currents or great depths. * * * is, furthermore, particularly adapted for subaqueous application."

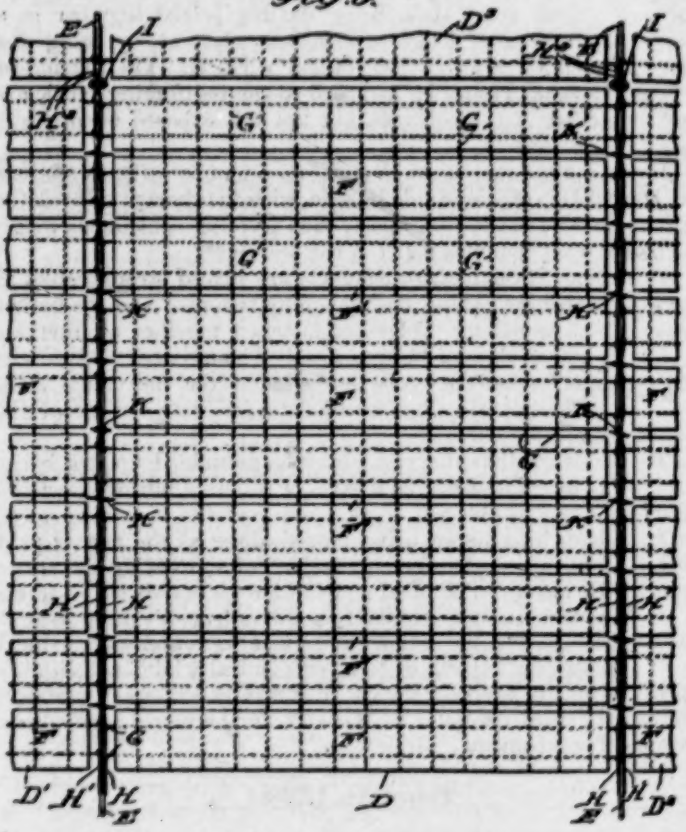
Patent No. 1173880

6. Patent No. 1173880 relates to a molding frame for casting the revetment mat of patent No. 1173879 and Figs. 1 and 3 thereof, reproduced herewith, are respectively a fragmentary top plan view of the patented mold, and a fragmentary transverse section

thereof on an enlarged scale. The patent discloses apparatus in which a complete section of the revetment mat may be cast at one time.

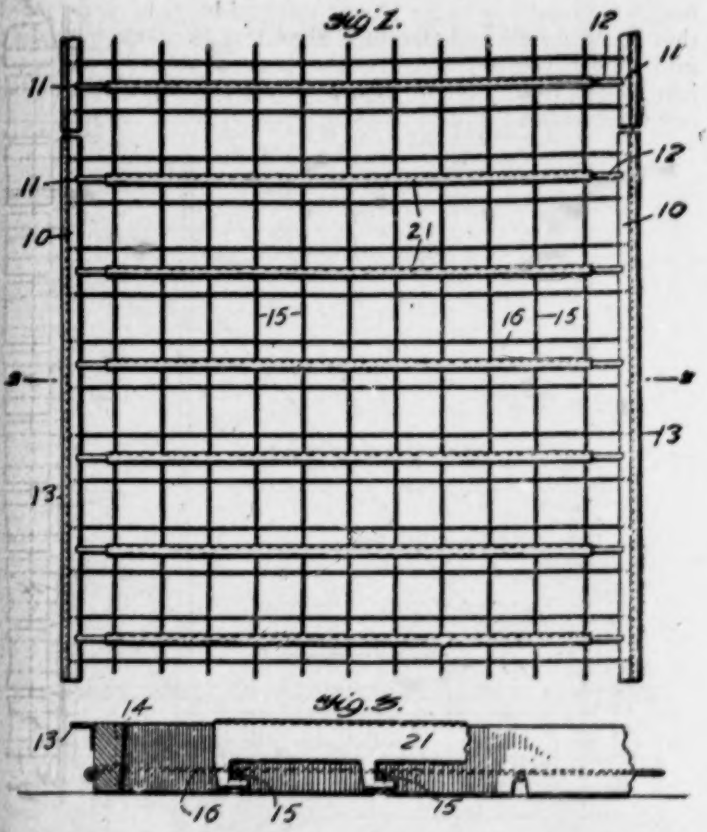
The mold is formed of a pair of longitudinal members 10, which form the end surfaces of the slabs forming the section, and a plurality of transverse members 12, which form the long sides of

Fig. 6.



the individual slabs, the transverse members being notched on their inner sides as at 11 to receive the ends of the transverse members 12, and both the longitudinal and transverse members being notched on their lower sides at the desired intervals to permit the reinforcing wire fabric or mesh to be held in position to be embedded in the concrete.

The inner faces of the transverse members 10 are beveled downwardly and outwardly to facilitate removal of the form after the concrete has set. Upon each of the transverse members 12 there is slidably mounted an L-shaped support 21 for the reinforcing wires. Arranged at intervals and longitudinally of the lower edge of each of the supports 21 are depending fingers or legs 23 which form stirrups for holding the reinforcing wires 15.



The supports 21 are shorter than the transverse members 12 on which they slide so that, after the concrete has been poured, they may be slid along the transverse members to disengage the fingers from reinforcing wires and may then be lifted from the mold frame. After the concrete has set, the mold is lifted from it.

50 Patent No. 1229152

7. Patent No. 1229152 relates to apparatus for launching t revetment mat of patent No. 1173879, and Figs. 1, 2, and 3 there reproduced on pages 7–8, show respectively the arrangement mooring barges, launching barge, and material barge; Fig. 2, top plan view of the launching barge; and, Fig. 3, a transver section thereof. The patent discloses the combination of moori barges 10, launching barge 11, and material barge 22, so arrang that the launching and material barges may be moved outward into the stream under control of the operator while the revetme mat is being paid out or launched over the shore side of t launching barge.

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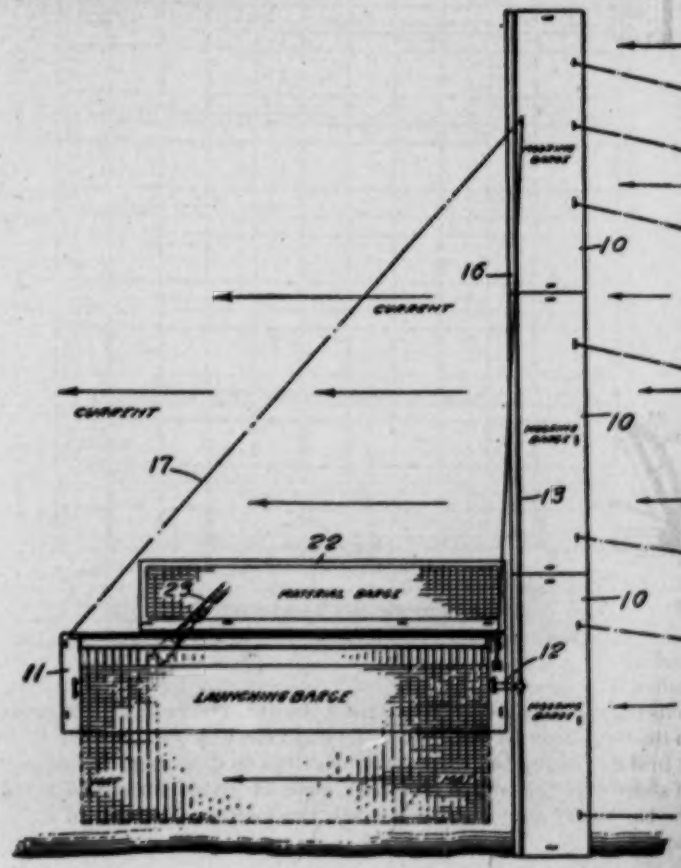

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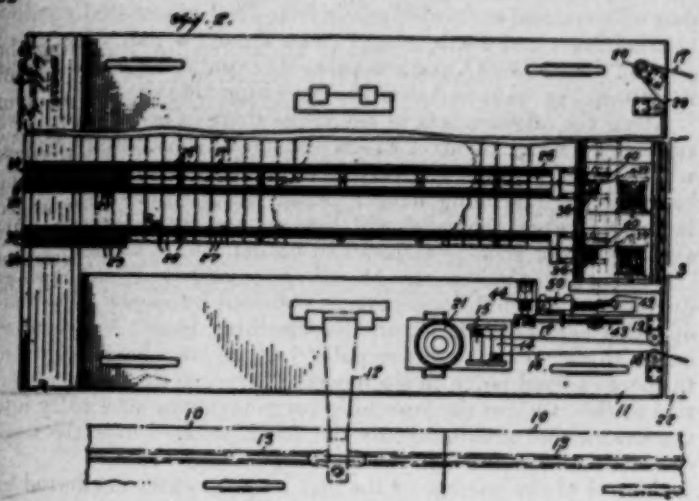

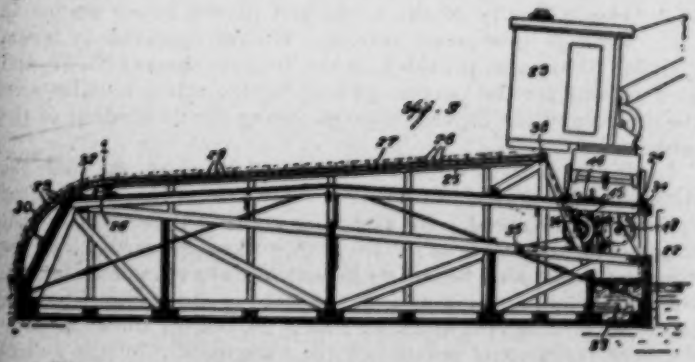

53 The construction of the launching barge disclosed includes a multiplicity of downwardly inclined ways 27 extending athwartship, parallel to each other and provided with rollers 28 upon which the slabs of the revetment mat ride during launching. The launching ways pass over the side of the barge to the discharge end in a smooth curve or arcuate portion.

In the curved portion of the ways there is mounted a succession of sheaves 29 between each of the ways 27, these sheaves carrying the launching cables over the curved portion of the ways. The supply of launching cable is carried on drums 34 journaled on

the barge at the head of the ways, there being one drum for each pair of ways, and each cable passes from its drum around a pulley 35, then back and forth several times around a pair of grooved friction sheaves 36, 37, and around another pulley 38 which directs it between the ways and over the launching sheaves 29.

Along the offshore side of the barge there is provided a track running fore and aft upon which is mounted a traveling crane 23 which serves to move the revetment sections from the material barge to the launching barge. After being transferred to the launching barge, the revetment sections are placed on the ways and the border strands fastened to the launching cables.

Control of the movement of the barge outwardly from the shore during the launching operation is obtained by means of power-operated capstans, 14, 15, on the launching barge connected to cables 16 and 17 running over pulleys on the launching barge and thence to a fixed point on the mooring barge, so that upon operation of the capstans the launching barge is drawn outwardly into the stream, and simultaneously the mat is lowered over the ways on the shore side and into the water.

Control of the passage of the mat into the water is effected by means of the friction sheaves 36 at the top of the ways around which the launching cables pass, and which are driven in unison by connecting gears from a main drive shaft extending
54 longitudinally of the barge and driven by an engine 44 through interposed gearing. Brakes operated by steam cylinder 50 are also provided on the friction sheaves 36, 37, and on drums 34 for the purpose of keeping the cables taut between the drums and the friction sheaves during the unwinding of the cables.

In this manner, as the launching barge is drawn out from the shore, the mat is paid out over the shore side of the barge at the desired rate of speed. By attaching additional sections of mat to the launching cable as the barge is worked outwardly into the stream, the mat may be laid as far out into the stream as desired. During launching the weight of the slabs on the inclined portion of the ways is carried upon the rollers 28, that of the slabs passing over the arcuate portion of the ways partly by the rollers and partly by the launching cables, and that of the slabs which have left the ways but not yet reached bottom by the launching cable, so that the border strands and individual slabs never are called upon to support more than the weight of one slab.

8. During January and February 1917 certain revetments were placed by defendant in the Vicksburg, Mississippi, harbor and subsequently, but prior to May 9, 1917, at Red Fork, Arkansas, having the construction shown by plate 13 of plaintiff's exhibit 5, reproduced on page 11.

9. During the time and at the places stated in finding 8, the defendant had at hand, and used, in casting the concrete revetment mentioned in finding 8, certain revetment molds or forms having the construction shown by photograph No. 17, of plaintiff's exhibit 6, reproduced on page 12.

10. Subsequent to June 5, 1917, and prior to the filing of the petition herein the defendant had at hand, and used in the United States in sinking concrete revetment mats, apparatus having the construction shown in plates 15 and 17, of plaintiff's exhibit 5, reproduced on pages 13 and 14.

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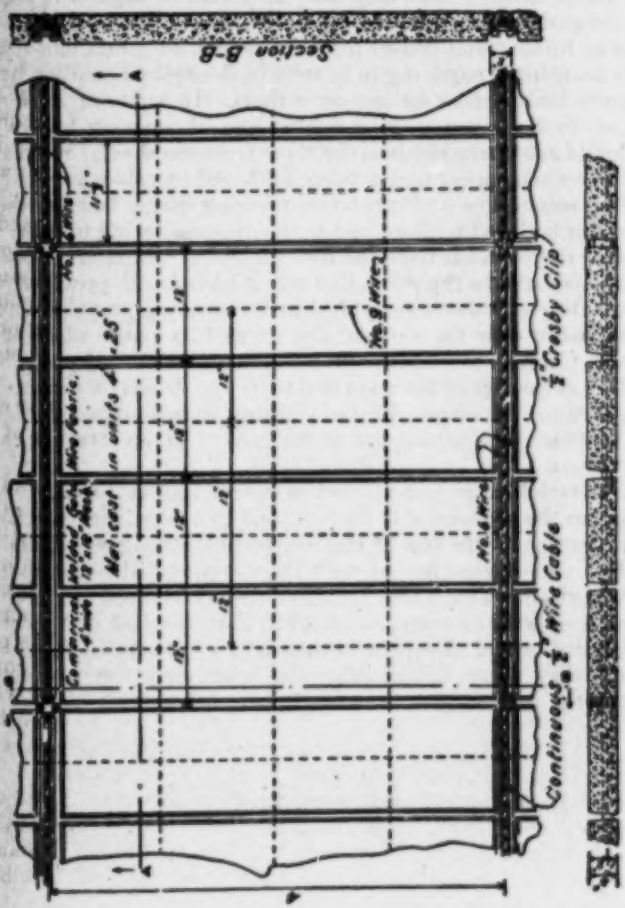


61 11. For many years prior to the application for the patents in suit, it was customary to protect the subaqueous banks of the Mississippi River by means of so-called fascine mattresses or mats, the construction of which and the apparatus for laying which are shown in defendant's exhibits 25 and 26, and 78 and 79, reproduced on pages 16–17. Defendant's exhibit 25 is the same as 78, and 26 the same as 79. Such mats and apparatus are also shown in plaintiff's exhibit P–5, pages 11 to 16, inclusive, plates 8, 9, and 10.

The said fascine mattresses or mats consisted of bundles of willow brush about 8 feet long and 12 inches in diameter, tightly compressed and wired together at intervals. The bundles of willows so formed and lashed together resembled a raft and floated after launching, requiring to be sunk in the desired position by the distribution of stone ballast over them. In applying such protection to the river bank, a double line of mooring barges was anchored extending out into the river from the shore, the first line or upstream mooring barges being anchored by cables to the shore, and the second line or downstream mooring barges being anchored by cables both to the shore and to the upper mooring barges. Extending downstream from the lower mooring barges and approximately parallel to the shore line was a ways barge provided with a plurality of downwardly inclined launching ways extending athwartship over the sides of the barge to a point adjacent the water. Cables attached to the mattresses to be lowered passed over pulleys at the top of the ways and thence to drums on the offshore side of the ways barge. Brakes working on said drums permitted the control of the paying out of the lines or cables attached to the mattresses.

A material barge was moored alongside the launching or ways barge on the offshore side thereof, and provided with horizontal ways leading to the top of the inclined launching ways, and the offshore end of these horizontal ways was provided with a notched or V-portion. The willow brushes and poles used to form the bundles of willows were assembled in these notched or V-portions and rolled or slid along the horizontal ways to the inclined ways where they were bound into the mattresses preparatory to launching.

65 In order to launch the mattresses which had been previously constructed and rested upon the launching ways, the brakes on the drums carrying the cables were slacked off, the launching barges pulled out into the stream by means of cables secured to the lower mooring barges, and simultaneously the mat was allowed to slide down the ways, the outer ends of which were rounded off, and to drop into the water where it floated into position, the inshore ends of the mattresses being secured by cables to suitable anchoring posts or so-called "dead men" on the shore. When the mat reached the water, the brakes on the drums carrying the cables attached to the mat were set, to hold the floating mat in the desired position. As portions of the mat were launched, new bundles of willow brush and poles were bound successively in position in the mat and thus the mat could continue to be laid out in the stream as far as might be desired.

After as much of the mat had been floated as was derived a crew of men would carry stone ballast consisting of pieces of stone of as large size as could be conveniently carried by one man, known as "one-man stone," and this stone was scattered over the entire surface of the mat until it was ready to sink, whereupon the addition of more stone at the proper points would sink the mat. Thereafter barges were towed over the sunken mat and additional stone ballast dropped into the water to hold the mat in position.

12. The willow brush ordinarily used for the construction of the mattresses was generally obtained by cutting from sand bars in the river where it grew. The willow growth on these sand bars tended to check erosion thereof and the destruction of the willow growth to provide materials for the fascine mattresses tended to permit further erosion of such sand bars.

13. Neither fascine mattresses nor concrete mattresses are permanent because the cables which hold the bundles of willows or concrete blocks rust and ultimately give way. Likewise the permanency of the mat depends upon the thickness of the concrete slabs on the one hand and the weight of the riprap rock employed to hold down the fascine mat on the other hand. The life of a given mat, fascine or concrete, depends upon the
66 location in which it is placed, the swiftness of the current, and other factors such as weight and permanency of fastening.

14. The construction and sinking of such fascine mattresses and the repairing and replacing of damaged mattresses were carried on during such times as weather and river conditions permitted, by so-called revetment parties consisting of gangs from 150 to 250 men, mostly laborers, engaged in the work.

15. The patentee from about 1910 was employed by the defendant on the Mississippi River Commission at a salary of $75 per

month, and from then until May 1917 served as junior engineer and chief of a revetment party, his salary being gradually increased to $135 per month. He was thoroughly familiary with the construction and sinking of fascine mattresses and the apparatus used in such work, and he supervised and directed the construction and sinking of about 70 such installations, using apparatus described in finding 11. He left this employment in May 1917 to become a candidate for a commission in the United States Army.

16. As junior engineer and chief of a revetment party, plaintiff's duties comprised not only constructing and sinking willow mattresses but also assisting in making computations, drawings, and designs and specifications for floating plants pertaining to brush revetments and channel control, and various miscellaneous office duties, as well as the repair of damaged mattresses.

17. The structures disclosed by the patents here in suit were conceived and developed by the plaintiff during the period while he was employed by the defendant as a junior engineer under the Mississippi River Commission.

18. On November 25, 1913, Major Woodruff sent from the District Engineer's Office, Third District, Vicksburg, Mississippi, to Chiefs of Revetment Parties, including plaintiff, a letter on the subject "Failures of bank revetments." This letter read as follows:

"Circular:

"In order to comply with instructions of the Mississippi River Commission, all chiefs of revetment parties will submit to this office on or before April 1, 1914, a report in as much detail as practicable, of the causes of failure of bank revetment in
67 this district, and their views as to what changes in the methods of construction should be adopted in order to prevent these failures."

This letter is in evidence as defendant's exhibit 1.

19. In compliance with this order plaintiff submitted on or about February 12, 1914, a report entitled "Sketches Showing Failures and Recommended Revetment Types," which report is in evidence as defendant's exhibit 2. In this report plaintiff proposed the pouring of concrete, reinforced with #14 hog fence wire mesh placed near the top of the layer, as a substitute for the riprap paving (broken stone) then customarily employed for upper bank protection. This concrete construction was not intended as a substitute for the willow mats used on the subaqueous banks.

In said report plaintiff stated:

"The lower bank protection of willow mats, it is thought, answers quite satisfactorily the purpose for which designed, as long

as it lasts. But the life of a mat is very debatable ground, is considered a remote factor very secondary in consideration to the overfailing riprap, and accordingly will be passed over in this discussion."

20. While on leave of absence at Lufkin, Texas, under date of May 10, 1914, plaintiff wrote to the District Office, Third Mississippi River District, a letter enclosing certain correspondence with The Cement-Gun Company relating to proposed designs for and demonstrations of concrete pouring equipment, which letter and enclosures are in evidence as defendant's exhibit 3. In this letter plaintiff stated:

"The information sought came too late to incorporate in report recommending concrete as a substitute for riprap, so that I felt that I lacked sufficient authority to carry the investigations further after submitting the report as mentioned previous to April 1."

Plaintiff also stated:

"I would be glad of authority to investigate the matter further."

21. Under date of May 19, 1914, plaintiff's then superior officer, Major Slattery, wrote plaintiff a letter which is in evidence as plaintiff's exhibit 4–A, stating:

"I am pleased that you sent this matter to the office. I am
68 anxious that all chiefs of party as well as others working under the office, should constantly study the work on which they are engaged with a view to improving methods and effecting economies, and suggestions to such ends will always be appreciated.

"I doubt if concrete paving less than four inches in thickness would be advisable for use in bank protection work. It is suggested that you further investigate the cement gun and see if it might not be possible to so modify its design as to permit placing thicker layers, and likewise to permit the use of concrete instead of cement mortar."

22. Plaintiff's proposals to use concrete, mentioned in findings 19, 20, and 21, contemplated the use of concrete in place of riprap or stone paving of the upper banks and not as a substitute for the willow mattresses used to protect the subaqueous banks.

23. The structure and apparatus disclosed in the drawings and description, plaintiff's exhibit 7, show conception of the invention forming the basis for the patent in suit 1173879 as early as October 6, 1914, and outside plaintiff's regular working hours, and on that date drawings and a written description of said apparatus prepared by plaintiff outside his regular working hours were forwarded through official channels to the District Engineer Officer, Third Mississippi River District, Vicksburg, Mississippi.

The description and drawings, plaintiff's exhibit 7, do not disclose the "friction device" of claims 6 and 8, nor the "friction

sheaves" of claim 9 of patent 1229152; nor do they disclose the "sheaves between the rollers" called for in claim 9 of said patent, and do not form a basis for conception of the invention covered by this patent.

24. Some time about April 1915 plaintiff was advised by his then superior officer, Major Slattery, that it had been decided to conduct a trial of plaintiff's proposed revetment, and that instructions had been given to make alterations in a brush mat-boat to adapt it to the laying of concrete slab revetments. Plaintiff was instructed to supervise this work and authorized to make a daily trip from the local office to the boat being altered for the purpose. Plaintiff carried out these instructions from day to day until June 28, 1915, at which date the alterations had proceeded well toward completion.

69 25. On that date, as a result of personal differences with his superior, plaintiff was assigned to new duties in a different place and went on leave of absence. Thereafter, on June 30, 1915, he applied for reinstatement which was refused. The work of supervising the completion of alterations to the brush mat-boat was assigned by Major Slattery to one A. J. Rife and subsequently completed by him.

26. The work of making the alterations in the brush mat-boat referred to in findings 24 and 25 was done in part by Government labor and in part on contract but the entire expense thereof was borne by the Government.

27. During July 1915, various attempts were made to lay concrete revetments with the said apparatus. A number of concrete revetment sections were cast and some were successfully launched. Under date of November 17, 1915, Major Slattery forwarded the president of the Mississippi River Commission an official report on these attempts. This report is in evidence as defendant's exhibit 33.

During these attempts several difficulties were encountered, among which were the cutting of the border strands by the sheave flanges when they passed over the sheaves, and the inability satisfactorily to control the paying out of the launching cables by the individual manual means then provided. Because of this latter defect, in one attempted launching the mat went out of control and was lost overboard.

Said difficulties clearly indicated that the launching apparatus in its then condition was not satisfactory and that changes were required.

These attempts were witnessed by plaintiff, who was on leave of absence at the time and took no official part in them. Plaintiff's expenses of attending the trials were paid by defendant.

28. At the conclusion of the tests at Greenville, plaintiff resumed his official duties at Vicksburg and as a part thereof prepared a modified design of apparatus for launching concrete revetments, intended to overcome the defects which were demonstrated by the Greenville tests. A blueprint dated August 1915 showing such modified design is in evidence as defendant's
70 exhibit 10, and was submitted by plaintiff to Major Slattery and explained to him, but because of lack of available appropriated funds construction of the modified apparatus was not then undertaken.

29. A modified apparatus was built in the spring of 1916. The design and construction of this modified apparatus were carried out under plaintiff's supervision and direction as a part of his officially assigned duties, and the cost thereof was borne entirely by defendant.

The modified apparatus differed from the apparatus tested at Greenville principally in being provided with stronger launching ways for carrying the concrete slabs, and a worm gear and continuous power driven shaft for controlling the paying out of all the launching cables in unison.

30. The modified launching apparatus referred to in the foregoing finding was tested at Delta Point in the latter part of July 1916, plaintiff assisting in the tests under the direction of Major Slattery, and a narrow strip of mat was successfully placed under extremely difficult conditions of current flow and intensity such as would rarely obtain on the river.

31 During the spring of 1916, plaintiff prepared designs and drawings for another concrete launching barge, known as mat-boat 1608, which was constructed at defendant's expense after completion of the Delta Point tests, under the supervision and direction of plaintiff, as a part of his regularly assigned duties. In the early part of 1917 this boat was used in placing concrete revetments at Vicksburg and Red Fork under plaintiff's supervision and direction. In May 1917 plaintiff gave up his employment and entered the army.

32. Plaintiff never built any concrete revetments for actual launching, never launched any, and never attempted to launch any except as a part of his regularly assigned duties as an employee of the Mississippi River Commission, and in all tests where actual launching was either attempted or completed, the apparatus, labor, and materials were provided by the defendant and all expenses connected therewith were paid by defendant.

33. The launching apparatus originally disclosed by plaintiff in plaintiff's exhibit 7, discussed supra, was not sat-
71 isfactory for use for its intended purpose, but a satisfactory launching apparatus was developed as a result of the

Greenville and Delta Point tests, by modifying the original design to overcome the defects revealed by the Greenville tests, culminating in the design of mat-boat 1608.

34. The development of plaintiff's idea from a conception on paper to demonstrate practical and satisfactory apparatus for river control resulted from the use of defendant's facilities and funds for building and testing proposed apparatus in actual use.

Defendant received no compensation from plaintiff for the expenses incurred in conducting such tests. There is no evidence that defendant received any compensation for such expenses other than the benefits arising from the use of the revetments constructed and launched in these tests.

Patent No. 1173879

(The Revetment Patent)

35. Claims 3 and 6 of patent No. 1173879 are here relied upon, and are as follows:

"3. A revetment mat consisting of a plurality of sections having exposed border strands by which they may be connected to one another, connections for uniting the border strands of adjacent sections, each of the sections consisting of a plurality of similarly spaced and flexibly connected block units and a plurality of bonding members extending continuously through the blocks throughout the section whereby to flexibly connect the blocks thereof, the said bonding wires projecting beyond the sides of the section and connected to the said border strands, and continuous launching strands extending between the several sections in one direction and connected rigidly to the border strands thereof.

"6. A revetment mat including a plurality of sections spaced apart to form parallel longitudinal channels, each of said sections including a series of uniform blocks of plastic material, and a continuous bonding wire fabric extending through the several blocks and reinforcing and inseparably connecting the blocks in spaced relation, the borders of two sides of the said fabric, in the direction at right angles to the longest dimension of said block, being exposed whereby to provide means for handling and
72 connecting the several sections, and parallel launching strands extending between the said sections, and continuous throughout the mat within said channels, said launching strands being connected to the exposed borders of the wire fabric of adjacent sections whereby to connect the sections in contiguous spaced relation and form a flexible structure of revetment mat."

36. Prior to the filing date of the application which matured into patent No. 1173879, or more than two years prior thereto, there were available to the public the following printed publications and patents:

Engineering News, December 26, 1912 (pp. 1149–1201).
De Ingenieur, September 1907 (pp. 713–719).
De Ingenieur, October 1908 (pp. 783–793).
Engineering Record of June 7, 1913.
British patent to Hawkes, No. 21580 of 1907, Canadian patent to Hawkes, No. 110571.
United States patents as follows:

Rogers, No. 1071091.
Hultquist, No. 1086177.
Flagg, No. 946211.
Solomon, No. 449185.
Fichefet, No. 776898.
Hawkes, No. 869566.
McGillivray, No. 1112018.

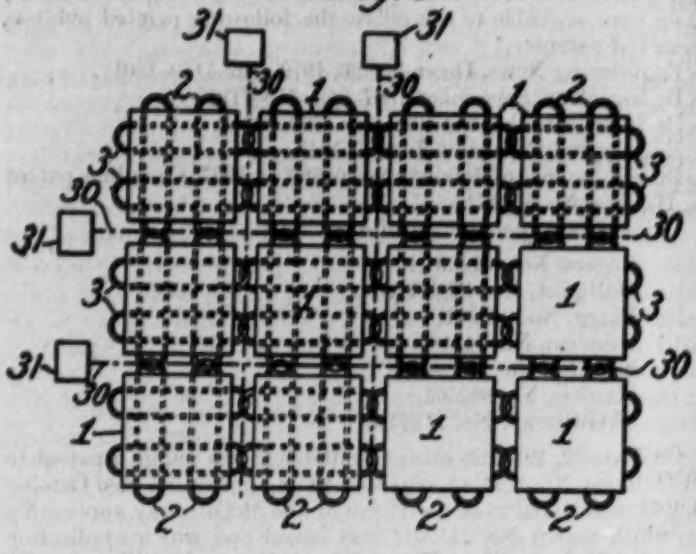
On June 22, 1915, there was available to the public a patent to McGillivray No. 1144143, patented on an application filed October 6, 1913, and stated to be a division of the McGillivray application on which patent No. 1112018 was issued and which application was filed May 17, 1913. Patent No. 1144143 to McGillivray adds nothing material in this respect to McGillivray patent No. 1112018.

Defendant also has offered as a part of the prior art a pamphlet of Western River Protection Company (defendant's exhibit 76) entitled "Crown Flexible Rip-Rap—The Hawkes System," copy of which was received by Major Schulz, of the Corps of Engineers, in 1910. The pamphlet by the Western River Protection Company adds nothing material in this respect to the Canadian patent to Hawkes.

37. Of these publications and patents mentioned in the foregoing finding, the Canadian patent to Hawkes No.
73 110571 (defendant's exhibit 97) is the closest approximation in the prior art to the construction of the patent in suit.

In the Hawkes Canadian patent, Fig. 3 of which is here reproduced, there is disclosed a flexible reinforced concrete revetment mat formed of individual blocks 1, each block having its reinforcing wires extending beyond the block into loops 3. Interwoven through certain of the various loops 3, there is provided a plurality of cables 30 extending in one direction and interwoven between others of the various loops 3, and extending at right angles to the first mentioned series of cables 30 is another series of cables 30.

Fig. 3



There is no disclosure in this Hawkes patent that the cables 30 are rigidly secured or tied to the loops 30. On the contrary, so far as any specific construction is disclosed, the cables 30 are merely passed through the loops 30.

The cables 30 are not launching cables, but anchoring cables intended to anchor the mat in place once it has been placed in position.

74 38. It was well known in the prior art to use concrete slabs or blocks provided with metallic reinforcing members cast therein and protruding therefrom, and with large numbers of such slabs or blocks flexibly connected together in various ways to form a more or less flexible blanket, which was placed upon the portion of the bank to be protected.

Once such a blanket was properly placed over the subaqueous bank to be protected there would be no difference in the action of such prior art blanket and that of the patent in suit so far as protection of the bank is concerned.

The difficulties of handling and properly placing such a structure, which is necessarily heavy and bulky, are considerable even in shallow and quiet water, and are increased by increases in depth of water and disturbances thereof, such as strong currents.

39. Plaintiff's revetment differs from the prior art in that the mat is formed in sections spaced apart to form parallel longitudinal channels extending through the mat, each section being made up of a number of similarly spaced flexibly connected blocks with the reinforcing extending throughout the entire section, and with the outer reinforcing wires or border strands of the reinforcing fabric of each section extending into the longitudinal channels between sections, where they are rigidly secured or tied at each block to the parallel launching cables which extend through each longitudinal channel.

This construction was of real practical importance because it made it possible to launch the mat over ways having sheaves thereon at the outer ends to carry the launching cables, and which cables in turn carry the weight of the individual blocks individually in their journey from the ways to their resting place on the bottom, thus preventing dangerous accumulation of stresses in the concrete or reinforcing members of single blocks; i. e., the weight of each block of the mat in transit from the ways to the bottom is sustained directly by the launching cables and not by other blocks, whereby each block and its reinforcement are required to sustain only their own weight.

This construction, while no more efficient or effective in its protective action than the prior art flexible concrete mattresses once properly placed on the bottom, was capable of being launched in an inexpensive, relatively quick, and completely reliable manner, even in strong currents and deep water, whereas those of the prior art were not.

40. There is no disclosure in the prior art of a flexible concrete mattress having the structure defined in claims 3 and 6 of the patent in suit. This structure was not obvious and arose above mere mechanical skill. The prior art shows that those skilled in the art who were attempting to solve the problem of using concrete in reveting subaqueous banks failed to perceive its value and the advantages it afforded.

41. Claims 3 and 6 of patent No. 1173879 define a new and useful art, machine, manufacture, or composition of matter, or a new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before plaintiff's invention or discovery thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, and of which the plaintiff was in fact the original, first, and sole inventor.

42. The revetments launched by defendant during January and February 1917, at Vicksburg, Mississippi, the structure of which is stated in finding 8, employed the substance of plaintiff's contribution to the art in patent No. 1173879, and claims 3 and 6 of said patent in terminology fairly define said structure.

Patent No. 1173880

(The Mold Patent)

43. For the purpose of this suit plaintiff relies on claims 2 and 7 of patent No. 1173880. These claims read as follows:

"2. A revetment mold comprising a frame, including spaced longitudinal and transverse members having recesses in the bottoms thereof, a detachable device for supporting bonding wires carried by each of said transverse members and including a substantially L-shaped body, one edge of said device being provided with a plurality of lugs forming slots for the reception of certain of said wires.

76 "7. A revetment mold comprising a frame including longitudinal and transverse members having notches in the bottom thereof, and means detachably connected to certain of the members of said frame and movable longitudinally thereof and adapted to detachably support a fabric reinforcement in said notches."

44. Prior to the filing date of the application which matured into patent No. 1173880 there were available to the public the following patents relied upon by defendant as showing the prior art:

Larsen, No. 940935.
Finger, No. 782230.
Hitpas, No. 688949.
Snow, No. 1179673.
White, No. 833814.
Twichell, No. 400521.
Miles, No. 429935.
Burrage, No. 540851.
McCall, No. 657827.
DuBois, No. 683557.
Roberts et al., No. 1037602.

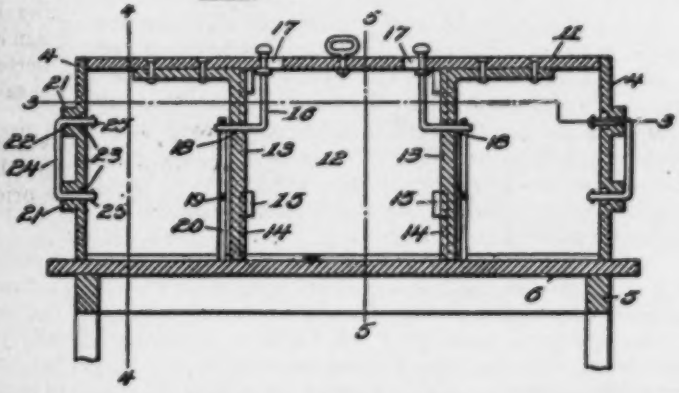
45. None of these patents were cited by the Patent Office. Of these patents only those to Larsen, Finger, and Snow relate to molds for the casting of concrete blocks, and of these latter the patent to Larsen is the closest approximation in the prior art to the structure of the patent in suit.

The Larsen patent, Fig. 2 of which is reproduced on page 30, discloses a collapsible mold for casting two-part concrete blocks, the two parts of the block being held together by reinforcing wires cast in the concrete. These wires have to be supported at the proper height while the concrete is setting, just as do plaintiff's wires.

The Larsen mold comprises a frame, including spaced longitudinal and transverse members 4, 6, and 10, having slots or notches 20 in the bottom of transverse members 10 to accommodate the bonding wires. So-called latches 16 slidable horizontally in slots 17 extend through the top 11 of the core, and have their bottom ends bent horizontally to pass under and support the bonding wires 19 in slots 20. In order to disengage the latches 16 77 from the bonding wires, they were separately moved in opposite directions in the slots 20.

Claim 7 fails to distinguish structurally from the apparatus disclosed by the Larsen patent and is anticipated thereby.

Fig. 2.



The structure defined by claim 2 differs from that disclosed in Larsen in that the supporting lugs for the bonding wires are grouped together in pluralities on each supporting bracket, so that a number of lugs may be disengaged from their wires simultaneously by sliding movement of a single bracket, whereas in Larsen individual sliding movement of each bracket in an opposite direction is required.

To provide a plurality of lugs instead of one lug on each slidable supporting bracket so that they may be operated in groups

instead of singly, is a matter within the skill of one skilled in the art. An increase in the size of the mold and the number of wires to be supported, which would render individual operation of the lugs inconvenient or time-consuming, would immediately suggest the desirability of operating the lugs in groups.

Claim 2 fails to distinguish over Larsen by any structural differences involving invention, but distinguishes only by differences within the skill of one skilled in the art.

46. Claims 2 and 7 of patent No. 1173880 fail to define
78 any invention or discovery of any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, patentable under R. S. sec. 4886 (U. S. C., Title 35, sec. 31).

Patent No. 1229152

(The Launching Patent)

47. For the purpose of this suit plaintiff relies upon claims 2, 6, 8, and 9 of the patent No. 1229152. These claims read as follows:

"2. An apparatus for laying revetment mats comprising a plurality of mooring barges, a launching barge connected thereto, a material barge associated with said launching barge, means for transferring the mats from the material barge to said launching barge, means for controlling delivery of said mat from said launching barge, means for moving said launching barge longitudinally of said mooring barges, as the mat is being launched, and means for guiding said launching barge during its longitudinal movement.

"6. A launching barge for revetment mats comprising launching ways terminating at the delivery ends in downwardly curved inclines, sheave supporting frames associated with said curved portions, sheaves mounted in said frames in close proximity to each other, cable carrying devices mounted in said barge, launching cables carried by said devices and to which the mats are to be secured at opposite sides, mechanism for moving the barge to feed the mat therefrom, a friction device associated with each of said cable carrying devices and including friction sheaves over which said cable passes, and an adjustable brake band for controlling the speed with which the cable is fed from said devices.

"8. In an apparatus for laying revetment mats, a barge having transversely extending roller ways and sheaves between the rollers, a cable carrying drum mounted on the barge, a friction device on the barge adjacent the drum, a launching cable to which mats are

to be secured at opposite sides, said cable passing from the drum to the friction device and from said friction device over the sheaves between the ways, and means for operating the friction device to feed the cable and mats from the barge.

"9. In an apparatus for laying revetment mats, a barge having transversely extending ways, sheaves between the ways, a
79 cable carrying drum mounted on the barge, a pair of friction sheaves geared together, a launching cable leading from the drum over and around the friction sheaves and from said sheaves to and over the sheaves between the said ways and to which mats are to be secured at opposite sides, and means for operating the friction sheaves to feed the cable from the drum."

48. Prior to the filing date of the application that was matured into patent No. 1229152 there were available to the public the following patents relied upon by defendant as showing the prior art:

Fichefet, No. 776898.
Smead, No. 812374.
Casse, No. 883084.
Toennes, No. 991041.
Curtis, No. 1099845.
Chenoweth, No. 1187502.
Solomon, 449185.
Osgood, 330043.

49. Of the said patents listed in the foregoing finding that to Fichefet is the closest approximation to the patent in suit. In the Fichefet structure, Figs. 1, 2a, and 5 being reproduced on pages 33–34, there is provided a barge having launching ways for laying hollow concrete blocks on the subaqueous banks. In laying the blocks with the Fichefet apparatus the blocks are strung on wires like beads on a string and slid down the ways. There is no disclosure in this patent of launching ways terminating at the delivery ends in arcuate portions; no sheave frame or sheaves associated with the arcuate portion of the ways; no roller ways and sheaves between the rollers; no launching cable to which mat sections are to be secured at opposite sides; and no pairs of friction sheaves geared together with a launching cable leading from a drum over and around the friction sheaves and over the sheaves between the ways.

The structure defined by the claims of the patent in suit here relied upon is not to be found in the Fichefet patent.

50. The closest approximation of the prior art to the structure of the patent in suit is the fascine mattress launching plant, a typical example of which is described in finding 11, supra,

80

Fig. 1.

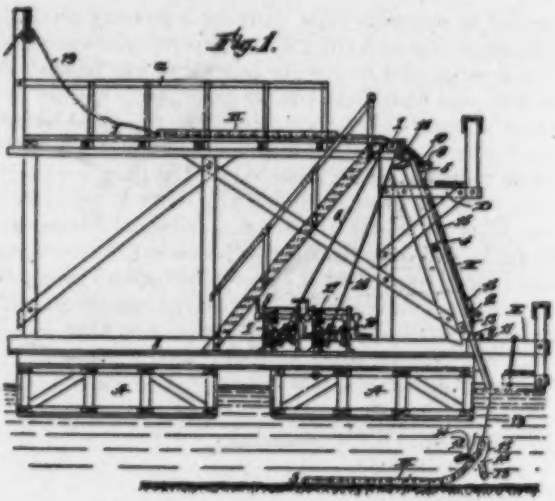
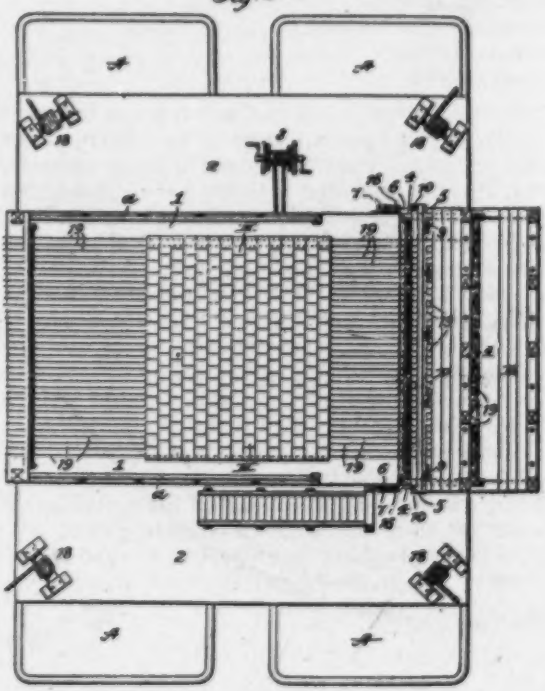


Fig. 2.



81

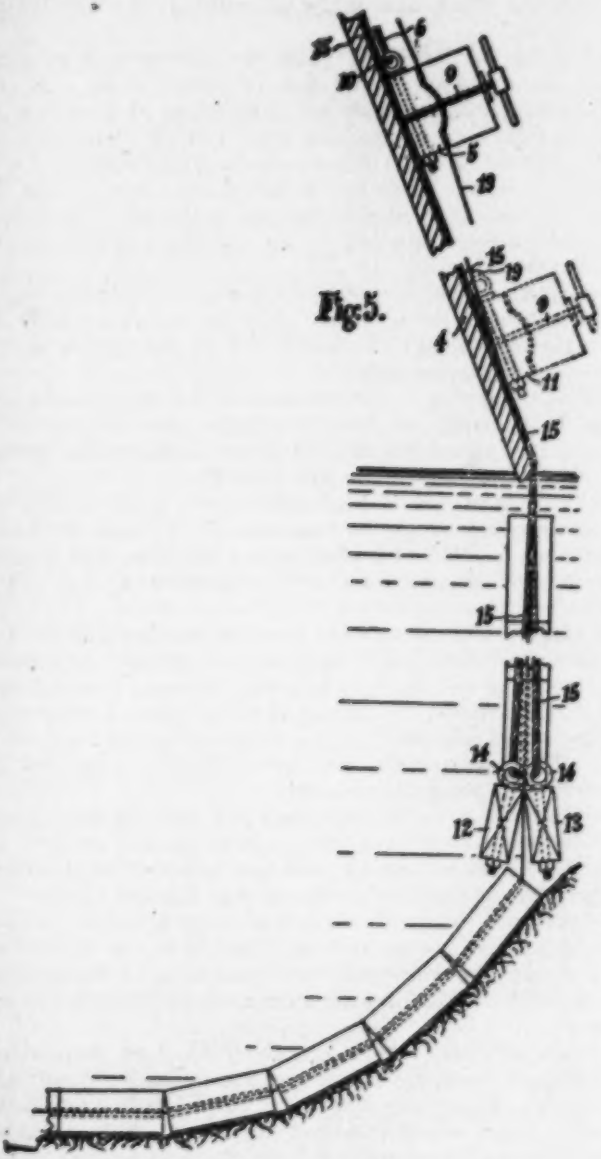


Fig. 5.

which launching equipment was not cited by the
82 Patent Office during the prosecution of plaintiff's application.

In the fascine launching plant the arrangement of mooring barges, launching barge, and material barge, is the same as that of the patent in suit; skids are mounted on the material barge abutting skids on the launching barge (which latter skids terminate in launching ways) for transferring the bundles of willows from the material barge to the launching barge. Some degree of control was exercised over the mat in process of launching by cables which were attached to the mat and passed over drums provided with brakes.

Although with the fascine plant it was customary to apply the brakes to control the mat only after the mat was partly in the water, the terminology of claim 2 fails to distinguish in this respect over the fascine plant.

During the laying of the fascine mat the launching barge was guided in its movements by various cables passing to other boats.

Claim 2 of patent No. 1229152 fails to distinguish structurally from the typical fascine mat launching plant.

51. Claim 2 of patent No. 1229152 fails to define any invention or discovery of any new and useful art, machine, manufacture, or composition of matter or any new and useful improvements thereof, patentable under R. S. sec. 4886 (U. S. C., Title 35, sec. 31).

52. Claims 6, 8, and 9 define structure not found in the fascine mat plant and more particularly the arrangement of sheaves between the ways and the launching cable passing over the sheaves. This structure made the placing of the heavy and bulky concrete slab revetment relatively simple, inexpensive, and easily controllable. This structure was not obvious and not suggested by the prior art or by the problem itself.

53. Claims 6, 8, and 9 define new and useful improvements of machines not known or used by others in this country before plaintiff's invention thereof, and not patented or described in any printed publication in this or any foreign country before
plaintiff's invention thereof or more than two years prior
83 to his application, and not in public use or on sale in this country for more than two years prior to his application, and of which the patentee was in fact the original, first, and sole inventor.

Since June 5, 1917, and prior to the filing of the petition herein, the defendant has made and/or used apparatus for launching concrete revetments embodying the gist of plaintiff's contribution to the art in patent No. 1229152, and claims 6, 8, and 9 of said patent fairly define said apparatus.

54. Plaintiff throughout the entire period of the origination and development of the devices described and claimed in the three patents in suit, was fully cognizant of the fact that the government proposed to make concrete slabs, revetments, and launching apparatus embodying any of his ideas found to be useful, and to continue using the same as a part of its then and future program of laying revetments in the Mississippi River, but at no time prior to October 26, 1917, did he make any claims for compensation for the use of any of his alleged inventions, or notify the government authorities that if any of his ideas were embodied in government structures or use he would demand compensation therefor.

55. On the trial of this case in open court the plaintiff withdrew any claim for damages on account of an alleged infringement of patent 1173880.

Conclusion of law

Upon the foregoing special findings of fact, which are made a part of the judgment herein, the court decides as a conclusion of law that claims 3 and 6 of plaintiff's patent 1173879 are valid and have been infringed by the United States, and that he is entitled to compensation therefor under the special jurisdictional act (Finding 2). The court also decides as a conclusion of law that claims 6, 8, and 9 of patent 1229152 are valid, and the apparatus covered by said claims has been used by the United States under an implied nonexclusive license to use the same and for which use the United States is not liable to respond in damages under the special jurisdictional act, and as to these claims the petition is dismissed. The petition as to patent 1173880 is dismissed (Finding 55).

84 *Opinion*

BOOTH, Chief Justice, delivered the opinion of the court:

The plaintiff is now in the Corps of Engineers, United States Army. He was prior to May 1917 an employee of the defendant on the Mississippi River Commission, having held this position for a period of seven years. Under the provisions of the act of June 25, 1910, 36 Stat. 851, as amended by the act of July 1, 1918, 40 Stat. 705, conferring jurisdiction upon this court in patent cases, the plaintiff, a patentee, is precluded from bringing suit against the defendant for an alleged infringement of his patent rights, because of his service in the Government at the time he makes his claim. A proviso to the foregoing acts so states.

The Congress enacted the special jurisdictional act, set out verbatim in finding 2. This act was approved by the President on December 17, 1930, and the present suit for infringement was commenced January 16, 1932. The parties to the case agree that the special jurisdictional act confers jurisdiction upon the court to

adjudicate the case irrespective of plaintiff's service in the Government and the statute of limitations, but seriously disagree as to the scope and meaning of the act in other respects.

The special act contains a number of specific and mandatory provisions imposing upon the court a method of procedure in adjudicating the issues, and it is these provisions which originate an interposed defense vital to the determination of a governmental liability for any infringement of plaintiff's letters patent.

The plaintiff takes the position that the express waiver of governmental service and the statute of limitations places the litigation in the same status as any other ordinary patent case, and that the additional express provisions of the act exacting consideration of governmental service, expenditure of Government funds in developing the inventions, etc., have exclusively to do with fixing the amount of compensation due in the event of a determined infringement of the patents.

Plaintiff's letters patent 1173879, relating to a revetment structure, were issued February 29, 1916, and on this date the patentee was an employee of the Mississippi River Com-
85 mission, serving as junior engineer and chief of a revetment party. On the same date letters patent 1173880 were issued to plaintiff relating to a molding frame for casting the revetment structure described in patent 1173879. Infringement of this patent is no longer claimed in this suit.

On June 5, 1917, the date when letters patent 1229152 for a launching apparatus were issued to plaintiff, he was a member of the Engineer Corps of the United States Army, having been commissioned as such about May 1917. Knowledge by Congress of the facts just stated, and of additional ones to be stated, was undoubtedly the reason for inserting the provisions of the special jurisdictional act which it is essential to quote. They are as follows:

"In determining whether or not said David McD. Shearer is entitled to compensation and the amount of compensation, if any, for the use of said inventions the court shall take into consideration, if and so far as the facts may warrant, the facts, if proved, that while said David McD. Shearer was engaged in perfecting the invention he was in the service of the United States as a junior engineer superintendent in charge of willow bank revetment construction under the Mississippi River Commission, and whether and, if at all, to what extent said inventions or any of them were discovered or developed during the working hours of his Government service, and to what extent his said inventions for protection of river channels and banks differ from the methods previously used, in material, method of laying, permanency, and value, and, whether if at all to what extent the expense of making experi-

ments, trials, and tests for the purpose of perfecting said inventions was paid by the United States, and if any such expense was incurred by the United States, whether and, if at all, to what extent the United States received compensation for such expense."

We think claims (3) and (6) of patent 1173879 and claims 6, 8, and 9 of patent 1229152 are valid and read upon the revetment apparatuses used by the Government. This fact does not however determine the defendant's liability as for an infringement of the same. The above-quoted provisions of the special jurisdictional act considered in connection with the provisions of
86 the entire act are of paramount importance in the ascertainment of governmental liability as claimed.

The plaintiff was for about seven years employed, as previously observed, as junior engineer and chief of a revetment party by the Mississippi River Commission, a governmental agency. During this entire period the adopted method of the Commission in revetment work was to utilize what is termed fascine mattresses. Fascine mattresses were made up of willow brush obtained near the banks of the river. The willow brush was segregated into bundles about 8 feet long and 12 inches in diameter, compressed tightly and wired together at intervals.

When the willow mattress was completed it resembled a raft, and after being launched floated upon the surface of the river. To accomplish its submergence at a desired point in the river bed the willow float would be weighted down by placing thereon a stone ballast consisting of large sized pieces of stone capable of being carried by a single workman. The plaintiff was thoroughly familiar with the process of constructing, launching, and sinking fascine mattresses and their value when placed in retarding erosion of both the banks and beds of the stream. He had supervised about seventy installations of fascine mattresses.

During the course of his extended experience in revetment work the imperfections of fascine mattresses to accomplish all that was desired became apparent to him. Being an engineer of ability he observed that fascine mattresses were of comparatively short life, that the cables which held them together yielded to rust, and upon their disintegration were readily susceptible to misplacement, exacting numerous replacements, and this was especially true with respect to subaqueous revetment work.

November 25, 1913, Major Woodruff, plaintiff's superior on the River Commission, addressed an order, the contents of which reached the plaintiff, calling attention to the "Failure of bank revetments" along the banks of the Mississippi River and directing the chiefs of all revetment parties to submit on or before April 1, 1914, their ideas as to the cause of said failure, and their sugges-

tions as to essential changes in the methods of construction employed.

87 The plaintiff on or about February 12, 1914, responded to the above order and in his report entitled "Sketches showing Failures and Recommended Revetment Types" proposed the use of concrete as substitute for riprap then used in upper bank protection. The record sustains an inference that at this time plaintiff was interested in the use of concrete in revetment structures.

We say this because plaintiff's proposal, while it referred especially to upper bank protection, also contained a reference to subaqueous willow mat protection, noting its imperfections, and indicating that the willow mat was good "as long as it lasts", and closing with an observation that in any event it was superior to ever-failing riprap.

In May 1914 plaintiff was on leave of absence and at his home in Lufkin, Texas. His interest in the use of concrete in revetment structure continued, and he communicated with the district office of the Third Mississippi River District, and among other things asked for authority to investigate further the subject matter under consideration.

Major Slattery, plaintiff's superior officer, willingly acceded to plaintiff's request, commended him for his report, and gave him plenary authority to study and report upon improved methods pertaining to the work in which they were engaged. On some indefinite date, but at least as early as October 6, 1914, plaintiff submitted to the District Engineer Officer of the proper district what is identified in the record as plaintiff's exhibit 7.

This exhibit is important; it is made up of detail drawings accompanied by a meticulous and lengthy description disclosing the method of constructing concrete mats and mattresses, an apparatus for their molding, and a mechanism for their launching, together with a discussion as to their availability for subaqueous revetments instead of fascine mattresses.

The plaintiff testifies and now contends that he conceived the apparatuses disclosed in exhibit 7 and prepared the exhibit itself outside his regular working hours.

The defendant challenges the fact and insists in addition that what the plaintiff did was within his duties and in pursu-

88 ance of the orders of his superior officer. On the date he forwarded exhibit 7 to the district office he was not upon an active duty status, being away on his vacation, and plaintiff is the only witness testifying to the date when he conceived the drawings and apparatuses disclosed by exhibit 7. Courts are loath to accept the uncorroborated testimony of a plaintiff as to this point. We think, however, that exhibit 7 in this particular instance furnishes

the corroboration. Eibel Process Co. v. Paper Co., 261 U. S. 45; Symington Co. v. National Castings Co., 250 U. S. 383.

The next important proceeding was inaugurated in April 1915. Major Slattery notified the plaintiff of the Commission's purpose to conduct a trial of the concrete revetment structure disclosed by him. To accomplish this act it was necessary to alter the mechanism used to launch fascine mattresses and plaintiff received express instructions to be present and supervise this work. Plaintiff was present and did personally supervise all that was done until June 28, 1915, on which date he was relieved of this assignment and transferred to other duties.

In July 1915 a number of attempts were made to launch and place concrete revetments in accord with plaintiff's disclosures. Concrete mats were cast and formed into sections and some of them were successfully launched. This trial however demonstrated difficulties of a serious nature in the launching apparatus, so serious that upon one attempt the entire concrete mattress went overboard and was lost. The necessity for changes in the launching apparatus was apparent and imperative. The plaintiff was present during this demonstration and while he took no official part in it his expenses were paid for attending it. This is known as the Greenville test.

In August 1915 plaintiff submitted to Major Slattery a blueprint disclosing his modified design intended to correct and overcome the imperfections of the launching apparatus used at Greenville. Plaintiff some time prior to this date had resumed his official duties at Vicksburg. This modified design was not immediately tested. The Commission lacked available appropriations to do so.

Early in 1916 plaintiff's modified design of the launching apparatus was constructed under his personal supervision
89 and subjected to a trial at Delta Point in July 1916. The record discloses that this trial was more successful than the preceding one, and concrete mats were launched and placed in position under conditions "of current flow and intensity such as would rarely obtain on the river."

The record establishes the fact that the value of plaintiff's conceptions was entirely dependent upon the efficiency and operativeness of a launching apparatus. A multiple of concrete slabs joined into sections and then into a unitary mattress brought into being a structure of great weight, and the real problem involved was the ways and means of transferring it from the banks of the river to the desired location in the river bed.

The plaintiff did make changes and alterations in the manner of launching the concrete mats and mattresses. The essential

changes, as the tests clearly demonstrated, were in the launching apparatus. In 1916 the plaintiff's final design of a launching apparatus appeared. This is identified as mat-boat 1608. The apparatus was successfully used in 1917 and concrete revetments were placed in the river at Vicksburg and Red Fork under plaintiff's supervision and direction.

It is conceded that the plaintiff did not on his own account, or at his own expense, ever at any time construct any one of the three structures for which he obtained letters patent. In is also conceded that all the materials which went into the apparatuses involved were furnished by the Government and all expenses incurred in the trials noted, as well as expense incurred by plaintiff, were borne by the defendant and that the defendant has not been reimbursed therefor.

Plaintiff during the entire period required to develop the utility of his conceptions, except when on vacation or change of assignment, was in direct charge of revetment work and obviously what he did was in the direct line of his employment and accomplished as a part of his regularly assigned duties.

The findings of fact correspond in detail to the provisions of the special jurisdictional act. There exists a long line of de-
90 cisions, too many to cite, which establish the rule that where an employee makes an invention, does no more than disclose it on paper, allows and encourages his employer to develop the same at his expense, supplying all the materials, paying all the expenses, and the additional ways and means of reducing it to practice, the employer acquires a nonexclusive implied license to use the same. United States v. Dubilier Condenser Corp., 289 U. S. 178; Gill v. United States, 160 U. S. 426; Knapp v. United States, 46 C. Cls. 601.

The facts in this case as to patent 1229152 bring it within the above rule as will hereafter appear, unless, as the plaintiff contends, these same facts extend and apply only to the quantum of compensation to be allowed in the event infringement of this patent by the defendant is determined.

When the provisions of a special jurisdictional act enjoin the court to determine the amount of compensation, if any, a patentee may be awarded for an infringement of his patent upon the basis of facts, which if found constitute a complete defense to the award of any compensation at all, it is difficult to ascertain the legislative intent with respect to this issue.

The report of the Committees having under consideration the special act in this case indicates that Congress intended no more than to refer the case to this court to be adjudicated as other patent cases are under patent law. Congress was aware of plaintiff's

governmental service and of the contributions made by the Government to the development of plaintiff's patents, and manifestly reserved the right to offset any award of compensation to the extent of the value of said contributions. The report of the committee appears in the appendix to this opinion.

This report, in view of the record in this case, contains several unintentional inaccuracies; at least the testimony in this case does not sustain its statement of facts in every particular. The court's findings disclose the variances. The debates in Congress occurring during the consideration of the special act unmistakably disclose that it was not intended in referring the case to this court to waive available governmental defenses, except
91 the statute of limitations and the prohibition of plaintiff's right to sue as expressed in the acts of 1910 and 1918 (supra). Binns v. United States, 194 U. S. 486; Gay v. Ruff, 292 U. S. 25, 31; United States v. St. Paul, Minneapolis & Manitoba Railway Co., 247 U. S. 310, 316, 317.

One may conceive an invention and procure a patent for it while in the Government service under circumstances which do not give rise to an implied nonexclusive license upon the part of the Government to use it. Dubilier Condenser Corp. v. United States, supra. Congress was aware of the law in this respect and, recognizing it, provided that in the event plaintiff's case fell within the law, nevertheless when it came to the issue of compensation such Government services, etc., were to be considered. They were not waived as a defense in the first instance. Familiar as the rule is, it is essential to state that the issue as to whether the patentee is the original and sole inventor of the patents involved relates to validity or invalidity of the patents. The issue as to infringement and compensation for the same is secondary. It is elementary that one may be the original and sole inventor of patented devices or mechanisms and still be unable to recover compensation for the use of the same by another. The user may be entitled to an implied license, a shop right, and may be able to establish a right of user without payment of compensation aside from these.

The plaintiff cites the case of Dahlgren v. United States, 16 C. Cls. 30. This precedent he confidently asserts sustains in every particular his construction of the special jurisdictional act. The report of the committee heretofore referred to mentions the Dahlgren case and states that the special act in this case "follows to considerable extent" the provisions of the special act referring the Dahlgren case to this court, and this statement is true.

It is also true that when the Congressional Committee observed the similarity, word for word, between the Dahlgren act and the one in the first bill introduced in the instant case, it immediately

amended the latter and omitted all reference to the purchase of the plaintiff's patents, and obviously gave heed to the letter
92 of the Secretary of War addressed by him to the chairman of the committee on March 1, 1927. Aside from this fact, however, we have grave doubt, in view of more recent decisions of the Supreme Court, whether the Dahlgren case may now be regarded as a controlling authority.

Special jurisdictional acts, it has long since been held, are to be strictly construed. The court may not consider moral obligations or look beyond the terms of the act for seeming injustices. We can not assume in the face of apparent ambiguity that the Government assumes a legal liability or any basis for one if the act itself leaves open a grave doubt as to the intent of Congress in this respect.

If the special act clearly intended that the jurisdiction of this court should only extend to adjudicating whether the plaintiff was the sole and original inventor of the patents involved, and whether or not his patent rights had been infringed by the Government, the act waiving defenses to the right and only minimizing the award of compensation, language indicating this intent was available but not used. Stanton v. United States, 68 C. Cls. 379.

Patent 1173879 in its specifications and claims relates exclusively to a revetment structure, and Fig. 6 in finding 5 illustrates the structure in detail. The plaintiff did contend for the validity and infringement of the seven claims of the patent. The court finds claims three (3) and six (6) to be valid and infringed (Finding 41). The novelty of this structure resides in the manner and form of the assembling of the concrete mats in such a way as to enable them to be safely and economically launched into the desired position in the stream.

It was not new to flexibly join together a multiplicity of concrete slabs spaced apart or to reinforce such slabs by the use of reinforcing wires to impart to them flexibility and tensile strength (Finding 38). The Hawkes Canadian patent (finding 37) closely approximates the patent in suit. The distinct difference between the plaintiff's mats and prior ones is embodied in a form of structure whereby each individual concrete mat is so formed and ingeniously attached to the longitudinal launching
93 cables as to form a concrete mattress which, in the process of launching, causes each mat unit to bear its own weight "in their journey from the ways to their resting place" on the bottom of the stream.

There is no evidence in the record that this method of assembly had ever been used before. Its conception involved invention. The plaintiff did employ certain elements old in the art and in

the way specified adapted them so as to function in a new and novel way.

The problem confronting plaintiff was not the construction of individual concrete mats. What the inventor had to do was to take a structure of unusual weight and attach it to cables of unusual strength in such a way as to move the same from one position to another without danger of disruption and without the accompanying danger of never being able to devise a launching apparatus which would operate to accomplish a successful launching of the same.

The plaintiff's novel method of attachments solved the problem. Plaintiff filed his application for a letters patent covering his concrete revetment structure on December 30, 1914, and by so doing reduced it to practice. It is true the plaintiff did not at his own expense and from materials owned by him construct a concrete mat, but he did supply detail blueprints and specifications sufficient in every particular to enable one skilled in the art to construct such mats, and his application for a patent embodied the same. The Mississippi River Commission adopted this patent and used the same.

The defendant inadvertently states in the brief "No device embodying any of the alleged inventions was built, nor application filed until after April 1915." The application for patent 1173879 was filed on December 30, 1914, and the patent was granted on February 29, 1916. Hence it is apparent that on December 30, 1914, the plaintiff had constructively reduced his patent to practice and his statutory monopoly dates from February 29, 1916. Automatic Weighing Machine Co. v. Pneumatic Scale Corp., 166 Fed. 288, 297. Telephone cases, 126 U. S. 1.

One defense interposed to the award of any compensation for the use by the Government of patent 1173879 is predi-
94 cated upon the doctrine of a nonexclusive implied license to use the patent. No doubt the Government is entitled to assert such a defense; this is conceded. To sustain the contention reliance is had upon the proved facts and circumstances under which the Government did use the patent, deducing from these facts a conclusion that the Government by furnishing the funds and materials to construct the mats and subjecting them to tests after completion thereby enabled the plaintiff to develop his conception and obtain his patent, a proceeding in which the plaintiff acquiesced and in which he participated without claiming compensation at the time of user.

As we perceive it, the defense is vulnerable from the standpoint of law and fact. True, the defendant challenges the validity of the patent and infringement of the same. On these issues our

decision is adverse. Therefore, under the cases cited the invention covered by plaintiff's patent 1173879 was developed and reduced to practice by him prior to defendant's tests which began in April 1915 and continued until 1916. It is one thing to subject a fully completed invention, well defined and covered by an application in the Patent Office, to tests in order to ascertain its availability for a particular use, and quite another to engage in experiments and other activities to create and develop one.

The plaintiff did acquiesce in the tests and supervised them as stated in the findings. He was anxious and so was the defendant that they should demonstrate the utility of the mats. The tests did not demonstrate a need for any subsantial change in mat construction, and as a matter of fact the principle embodied in their construction was then as it is now, and as it was on the date the plaintiff disclosed his conception to the officials of the Mississippi River Commission. The plaintiff sought compensation for the use of his patents soon after they were granted and his superior officer acknowledged their worth and would have compensated him if under the law he could have done so.

Patent 1173879 is not a basic invention and in no sense a pioneer one. It is limited, as previously stated, to the novel
95 method of connecting the concrete mats to the launching cables whereby the new and novel result is obtained of unifying the excessive weight of the same to a single concrete unit, enabling a successful launching of a concrete mattress to be obtained. Its value is limited to the value of this accomplishment.

The invention covered by patent 1229152 under the facts of record was developed in the regular course of plaintiff's governmental duties from materials furnished by the Government, and without expense to the plaintiff. We have heretofore given the detail history of the development of this patent. It is now only necessary to state that plaintiff's original conception of a launching apparatus disclosed in October 1914 is not identical with the patent disclosures.

Plaintiff's October 1914 launching apparatus did not successfully function in accord with his conception. The Greenville tests not only demonstrated this fact but pointed out to plaintiff the particular imperfections causing the failure, and he profited by the tests and thereafter changed his first concept of a launching apparatus in order to overcome them.

The changes made by plaintiff following the Greenville tests enabled the production by plaintiff of his blueprints dated August 1915 disclosing his modified design. The test made of this launching apparatus at Delta Point July 1916 proved its operativeness, but plaintiff was not satified with this design, for on

some date during the year 1916 he prepared the designs and drawings for the "mat-boat" 1608, and upon this design and drawings he filed his application for a patent.

As has been previously stated, the findings show, and the record amply supports them, that plaintiff's invention covered by his patent 1229152 was developed by him in the course of his official duties, at the expense of and from materials belonging to the Government. The perfected launching apparatus upon which plaintiff's patent was granted came into a completed unit by virtue of the activities of the Government in connection with plaintiff's engineering ability, and in our opinion the Government obtained a nonexclusive license to use the same. Gill v. United States, and Knapp v. United States, supra.

96 Plaintiff's recovery is limited to the infringement by the United States of claims 3 and 6 of patent 1173879. Pursuant to an agreement of the parties it is ordered that the case be remanded and referred to Commissioner Gordon to take testimony upon the question of reasonable and entire compensation as to claims 3 and 6 and report to the court. As to patent 1229152 the petition is dismissed for the reasons stated. It is so ordered.

WHALEY, *Judge;* WILLIAMS, *Judge;* LITTLETON, *Judge;* and GREEN, *Judge*, concur.

CALENDAR No. 1154

SENATE

71st Congress, 2d Session, Report No. 1118

DAVID McD. SHEARER

June 27, 1930.—Ordered to be printed

Mr. HOWELL, from the Committee on Claims, submitted the following:

REPORT

[To accompany H. R. 1825]

The Committee on Claims, to whom was referred the bill (H. R. 1825) for the relief of David McD. Shearer, having considered the same, report favorably thereon with the recommendation that the bill do pass with the following amendment:

On page 2, line 17, strike out the word "will" and insert in lieu thereof the word "willow."

The facts are fully set forth in House Report No. 763, Seventy-first Congress, second session, which is appended hereto and made a part of this report.

[House Report No. 763, Seventy-first Congress, second session]

The Committee on Claims, to whom was referred the bill (H. R. 1825) for the relief of David McD. Shearer, having considered the same, report thereon with a recommendation that it do pass with the following amendments:

In line 1, on page 2, after the word "determine" insert the following words: "any statute limiting the time within which such an action may be brought to the contrary notwithstanding."

In line 2, on page 2, strike out the word "and", insert a comma after the word "first" in the same line, and insert the words "and sole" after the word "original."

98 In line 4, on page 2, strike out the word "and", insert a comma after the word "first" in the same line, and insert the words "and sole" after the word "original".

In lines 9 and 10, on page 2, strike out the comma and insert a period after the word "adjudication", strike out immediately

following the word "adjudication" the words "and for a full and entire transfer of said several patents to the United States", and insert in lieu thereof the following words:

"The Court of Claims shall ascertain whether or not it is to the interest of the Government of the United States to use such patents, or either of them, after the date of said adjudication and, if it shall find that the said David McD. Shearer was the first, original, and sole inventor of said inventions and that it is to the interest of the Government of the United States to use said inventions, or any of them, after such adjudication, the Court of Claims shall render such judgment as will assure a full and entire transfer of said patents or such of them as should be so transferred and shall award to the said David McD. Shearer such compensation therefor as shall represent the value of the patent or patents awarded to the Government of the United States."

In lines 10 and 11, page 2, strike out the words "and in determining" and insert in lieu thereof the following: "In determining whether or not said David McD. Shearer is entitled to compensation and".

In lines 13 and 14 of page 2, strike out the words "as bearing on the question of reducing or increasing such compensation" and the comma following "compensation" line 14 of said page.

STATEMENT OF FACTS

The evidence before the committee presents the following facts:

That the claimant, Capt. David McD. Shearer, graduated as civil engineer in the Agricultural and Mechanical College of Texas in June 1909.

He served under the Mississippi River Commission in the third district, from September 1909, until the declaration of war against Germany in 1917, when he entered the United States Army as captain of Engineers. Went overseas, served in training, and in the Battle of the Argonne, France; later at headquarters of First Division in Germany, France, and this country.

He served with the Mississippi River Commission from 1909 to 1917 as junior engineer, acting as levee inspector, mechanical draftsman, and surveyor, mechanical engineer, superin-
99 tendent in charge of willow bank revetment parties, water parties, inspector of creosoted lumber, and finally, from December 1916 to May 1917, operated a concrete revetment party making and laying concrete revetment, which is his own invention.

In 1914, outside of office hours and not interfering with his duties and service as employee of the Mississippi River Commission, he invented a reinforced-concrete revetment; also molds for manufacture of said reinforced-concrete revetment; also appara-

tus for laying said reinforced-concrete revetment. He applied for and obtained patents on each.

The United States Government, through the Mississippi River Commission, adopted and used all three of said inventions, covered by said letters patent, is still using them, and is planning for their extensive use in the future.

This bill does not carry any appropriation.

This bill does not commit the Government to make any expenditures.

This bill simply provides a means by which Capt. Shearer may have consideration, by a competent judicial tribunal, and adjudication of his claim for compensation for such use of his said inventions, and if found entitled to compensation therefor to be awarded judgment for the compensation justly due him.

This bill is based upon and follows to a considerable extent the provisions of the act of Congress approved June 19, 1878 (20 Stat. L. p. 583), by which Congress conferred jurisdiction on the Court of Claims to adjudicate the claim of the estate of Admiral John D. Dahlgren for compensation for the adoption and use by the United States of certain inventions relating to ordnance patented by said Dahlgren, who was, at the time of said inventions, an officer in the United States Navy.

Before this invention of Captain Shearer, the only revetment in use for protecting and maintaing the bottom and sides of the river channel, below the water line, was a revetment manufactured from the willows growing along the banks of the river. This willow revetment was of two kinds, one known as the woven or basket willow, consisting of the smaller willow brush placed at right angles to each other and interwoven like basket work. The other was known as the willow fascine revetment, consisting of larger willow poles laid parallel to each other and fastened at intervals with wire.

There were numerous and serious objections to this revetment formed of willow, some of said objections being the following:

100 The willow wood being only slightly heavier than water even when thoroughly soaked, the revetment mats had to be sunk by means of heavy weights, generally of rock placed at intervals, in order to press them to the bottom and to hold them there when laid. The great difficulties of thus sinking the mats will be appreciated; secondly, where the willow mats at periods of low water, extend above the water line on the banks, the wood being alternately wet and dry rapidly deteriorated and rotted; third, there was great difficulty in laying and maintaining the rocks or weights for holding down the willow mats, especially on the slopes or sides of the channel; fourth, there was a great tendency to

breaking and lifting the ends or edges of this willow mat through movements of snags or undermining by the river current, and when the edges started to lift the weights holding the balance of the mat were displaced and great sections of the mat would roll up and be destroyed or washed away; fifth, the supply of willows for making revetment was becoming alarmingly scarce.

That this claimant, from his practical experience and observation, appreciated these shortcomings of the willow revetment and undertook the study of some improved form of revetment. By long application to the subject he invented a revetement consisting of concrete slabs or sections of rectangular form, 3 or 4 inches thick, having molded through the body of the slab wires, the protruding ends of the wires forming a means for attaching the slabs to each other, thus forming an extended sheet or mat of revetment.

The great and obvious advantages of this revetment over any previously used were as follows: First, the specific gravity of the concrete being much greater than water, it would sink readily and remain permanently where it was laid; second, it would form a floor for the bottom and sides of the river channel having the permanency of stone; third, being formed in sections with wire connections, it had all the advantages of flexibility, which enabled it to fit the river bottom when laid and to conform to any minor changes in the river bottom or banks that might later occur; fourth, it required no weights, subject to shifting of position, to hold it down; fifth, where this reinforced-concrete revetment extended above the water line of the banks at times of low water there was no rotting or deterioration; sixth, there was no possibility of the edges or ends of this concrete revetment turning up or washing away; seventh, the supply of concrete is of course unlimited; eighth, the actual cost of making and laying this reinforced-concrete revetment, as tested, fell below the cost of making and laying the unsatisfactory willow revetment.

101 He finally disclosed the character of his invention to his superior officers in the third district and at the same time applied for and obtained patents as follows:

On reinforced-concrete revetment; application filed December 30, 1914; Letters Patent No. 1,173,879, issued February 29, 1916.

On reinforced-concrete revetment mold; application filed August 20, 1915; Letters Patent No. 1,173,882, issued February 20, 1916.

Apparatus for launching concrete-revetment mats; application filed October 6, 1915; Letters Patent No. 1,229,152, issued June 5, 1917.

The said officers of the third district became interested in adopting and using this revetment in their work on the Mississippi River. This claimant consented to such use and aided and as-

sisted in carrying out the plans for the manufacture and laying of said reinforced-concrete revetment, employing exactly the form of reinforced-concrete revetment covered by his patent, the molds for manufacture of the same covered by his patent, and the apparatus for laying the same covered by his patent. He never intimated that he would not expect compensation for the use of said patent rights, but when the subject of compensation came up he received evasive answers and failed to obtain from said officers promises of granting such compensation.

Your committee finds that the inventions of Captain Shearer have been used by the Government to a large extent since said inventions were made and since said patents were procured and that it will be found upon hearing of said cause that the claimant is entitled to compensation therefor.

Captain Shearer asserts that he was not employed by the Government to invent or develop any concrete revetment or any revetment aside from the willow type previously in use; that no suggestion was made to him relative to changing the type, and that his study and development of these ideas were absolutely voluntary and independent on his part; that he received no increase in salary from the time he disclose these inventions to the officers of the third district until he left the service to enter the Army; that he paid the entire expense of said applications for patents, although said expense was a heavy burden, in view of his limited salary and the fact that he was a married man.

He asserts that no material or labor paid for by the Government was used in making his inventions. The material and labor furnished by the Government were consumed in making actual use of the inventions for the benefit of the United States. The expenditure by the United States was in construction of the
102 molds for manufacture of the concrete revetment sections and three sets of apparatus for laying the revetment mats. These molds and machines are, of course, the property of the United States. They will last for years and be available for constant use. These expenditures were not made in connection with Captain Shearer's invention.

He submits that there can be little or no use for the inventions he has produced except by the United States Government, for the reason that practically all protection of river channels calling for revetment is laid by the United States Government.

The claimant has been actively seeking the right to have made the adjudication herein provided for constantly since said infringement, and bills providing for the reference of said claim to the Court of Claims for adjudication, as herein provided for, have actually passed the Senate at former sessions of Congress. It is therefore deemed just that the claim should be protected from

any statute of limitation barring his action, since he has been diligently seeking the right to maintain such action.

The facts as asserted by Captain Shearer are controverted. The bill is carefully safeguarded by the amendments herein proposed and otherwise, and it seems but just that Captain Shearer be given opportunity to present his case to the Court of Claims, that court to determine what compensation, if any, should be granted him.

The letter from the War Department, dated March 1, 1927, is attached hereto and made a part of this report as follows:

WAR DEPARTMENT,
WASHINGTON, *March 1, 1927.*

HON. CHARLES L. UNDERHILL,
Chairman Committee on Claims,
House of Representatives, Washington, D. C.

DEAR MR. UNDERHILL: In further response to your letter of February 21, 1927, in which you request my opinion as to the merits of Senate bill 3701, for the relief of David McD. Shearer, I have to say that while it is the well-known policy of the War Department to encourage invention by those in Government service, to safeguard their interests in their dealings with the Government, and not to oppose legislation designed to give the Government inventor a day in court, that is to place him in the same position with respect to recovering compensation from the Government as is enjoyed by other members of the public; however, from a study of this bill I am constrained to conclude that its text goes considerably further than I have indicated above, and if passed by Congress would place Mr. Shearer in a much more favor-
103 able position than that enjoyed by the ordinary private claimant against the Government.

The Judge Advocate General has advised me that the language in line 7, page 2, of the bill, allowing compensation for use of the claimant's patents before the date of his letters patent constitutes an extraordinary remedy, contrary to the patent laws, and therefore not enjoyed by the public generally. The Judge Advocate General further advises that the bill fails to give the Government the right to interpose all of the defenses usual in infringement suits, and for this reason goes much further than merely to give Mr. Shearer a day in court. In this regard, it might be said that if this were an ordinary infringement suit the Government might be able to show that it had an implied license to use the inventions concerned and thus have a complete defense to the action. It is not at all clear that under the language of the bill the Government could so defend in the instant suit. Furthermore, the effect of the bill as submitted is to compel the purchase

of the patents in suit by the United States. It is, of course, obvious that compensation for the entire right, title, and interest in the patents would be greater than compensation for a mere license to practice the inventions, and, generally speaking, the War Department is interested in securing licenses only under patents it desires to use. The commercial value of patents for their use in other fields is of no concern to the Government.

In view of the above I find myself not in accord with those features of the bill outlined in the preceding paragraph. I assure you that as to the general purpose of the bill, namely, that of removing the disabilities under which Mr. Shearer now finds himself under existing law for having perfected his inventions while in the Government service, I have no objection whatever.

Sincerely yours,

DWIGHT F. DAVIS, *Secretary of War.*

104 *Proceedings following opinion of the court*

On April 28, 1938, the plaintiff filed a motion for a new trial.

On May 3, 1938, the defendant filed a motion for a new trial.

On October 3, 1938, the Plaintiff's and defendant's motions for new trial were argued and submitted by Mr. C. B. DesJardins for plaintiff, and by Mr. Clinton V. Edwards for defendant.

On November 14, 1938, the court entered the following order on said motions:

ORDER

IT IS ORDERED this 14th day of November 1938 that the plaintiff's and defendant's motions for new trial be and the same are hereby overruled.

Final argument and submission of case

On November 1, 1943, the case was argued and submitted on merits by Mr. Clarence B. DesJardins for plaintiff, and by Mr. J. F. Mothershead for defendant.

106 *Special findings of fact, conclusion of law, and opinion of the court by Whaley, Chief Justice*

Filed February 7, 1944

Mr. Clarence B. Des Jardins for the plaintiff.

Mr. J. F. Mothershead, with whom was Mr. Assistant Attorney General Francis M. Shea, for the defendant. Mr. Clifton V. Edwards was on the brief.

This case having been heard by the Court of Claims, the court, upon the evidence and the report of a commissioner, makes the following.

Special findings of fact

1. This is a patent suit filed to recover the reasonable and entire compensation for use by the United States of inventions covered by three United States patents issued to David McD. Shearer. The plaintiff Shearer was in the employment of the United States at the time he made the inventions covered by the patents, and the matter is before this court under a special act of Congress (Private, No. 285, 71st Congress).

The court in its special findings of fact and opinion of March 7, 1938 (87 C. Cls. 40), held that claims 3 and 6 of Shearer patent 1,173,879 were valid and had been used by the United States and that plaintiff was entitled to compensation therefor under the special jurisdictional act; that claims 6, 8, and 9 of Shearer patent 1,229,152 were valid, and the apparatus covered by these claims had been used by the United States under an implied nonexclusive license for which use the United States was not liable under the special jurisdictional act.

107 On the trial of this case in open court on the issues of validity and use the plaintiff withdrew any claim on account of an alleged infringement of the third Shearer patent 1,173,880, and the petition as to this patent was dismissed.

Reasonable and entire compensation is based upon the use of the first enumerated patent.

2. The accounting period in this case is from February 29, 1916, the date of issuance of Shearer patent 1,173,879, to February 28, 1933, the date of its expiration.

3. The Shearer patents relate to structures intended to protect the banks of rivers against erosion. These structures are called revetments and are customarily sunk in the river over the subaqueous portion of the bank and extend some distance out into the river bed and also up on the bank.

They are usually located on a river bend and extend along a sufficient portion of the bank to prevent the river current which impinges against the bend from eroding the bank.

The function of the revetments on a river is to stabilize the course of the river, and they have been constructed and used extensively on the Mississippi River for this purpose, the present accounting dealing with revetment work on this river.

Shearer patent 1,173,879 relates to a revetment structure, and Shearer patent 1,229,152 relates to an apparatus for the launching or sinking of the revetment.

4. Revetment patent 1,173,879.—This patent, upon which the present accounting is based, is directed to what is known as an articulated concrete revetment. It relates to a structure comprising a plurality of oblong concrete blocks with continuous reinforcing wires passing through the several sections. The sections are spaced apart so that the entire structure is therefore of a flexible nature and will therefore readily adapt itself to the contours of the bank or subaqueous portion of the river upon which it is laid.

The dominant feature of the disclosure is a series of launching cables, the border strands of the individual concrete blocks being fastened to the launching cables so that, as the mat is paid out or sunk from a launching barge, the launching cables support the entire mat and relieve the individual concrete units and the
108 mat sections from breaking strain. With respect to these features of construction, the patent specification states as follows:

"My present invention relates generally to revetment mats for the protection of subaqueous river banks and shores from current and wave erosion and to promote soil stability, and the object thereof is to provide a practical, economical structure of mat, the units of which are of concrete, whereby it may be placed in strong currents and in great depths of water.

"To this end my invention resides in the main in the connections both between the units themselves and between groups of such units, which connections will clearly appear from the following description, in which reference is made to the accompanying drawings, forming part of this specification, and in which—* * *

"A mat so constructed is not only economical of itself but is capable of being economically laid and is highly practicable for the purposes for which it is intended either in strong currents or great depths. My revetment as thus described is, furthermore, particularly adapted for difficult subaqueous application. * * * My revetment, furthermore, possesses the additional advantage of being fabricated entirely above the water and then lowered into place for use."

The claims of this patent which the court held valid and infringed were directed to a revetment mat structure and read as follows:

"3. A revetment mat consisting of a plurality of sections having exposed border strands by which they may be connected to one another, connections for uniting the border strands of adjacent sections, each of the sections consisting of a plurality of similarly spaced and flexibly connected block units and a plurality of bonding members extending continuously through the blocks through-

out the section whereby to flexibly connect the blocks thereof, the said bonding wires projecting beyond the sides of the section and connected to the said border strands, and continuous launching strands extending between the several sections in one direction and connected rigidly to the border strands thereof.

"6. A revetment mat including a plurality of sections spaced apart to form parallel longitudinal channels, each of said sections including a series of uniform blocks of plastic material, and a continuous bonding wire fabric extending through the several blocks and reinforcing and inseparably connecting the blocks in spaced relation, the borders of two sides of the said fabric, in the direction at right angles to the longest dimension of said block, being exposed whereby to provide means for handling and connecting the several sections, and parallel launching strands extending between the said sections, and continuous throughout the mat within said channels, said launching strands being connected to the exposed borders of the wire fabric of adjacent sections whereby to connect the sections in contiguous spaced relation and form a flexible structure of revetment mat."

5. The Launching Apparatus Patent 1,229,152.—This patent is directed to the mechanical structure of a launching barge for laying or sinking revetment mats. The specification indicates in its opening paragraphs that the apparatus is particularly adapted for use in connection with the articulated concrete mat of the revetment patent referred to in the previous finding.

The launching barge as disclosed in the specification of the patent provides the working space where the smaller units of the revetment mat are attached to the launching cables and are fabricated into the final structure of the complete revetment mat. Such fabrication begins with the launching barge close to the shore, and as the mat is progressively sunk over the side of the barge which is moved toward midstream, the fabrication of the units into the revetment structure is continued until the entire revetment mat is completed and sunk.

Claims 6, 8, and 9 of this patent are as follows:

"6. A launching barge for revetment mats comprising launching ways terminating at the delivery ends in downwardly curved inclines, sheave supporting frames associated with said curved portions, sheaves mounted in said frames in close proximity to each other, cable carrying devices mounted in said barge, launching cables carried by said devices and to which the mats are to be secured at opposite sides, mechanism for moving the barge to feed the mat therefrom, a friction device associated with each of said cable carrying devices and including friction sheaves over which

said cable passes, and an adjustable brake band for controlling the speed with which the cable is fed from said devices.

"8. In an apparatus for laying revetment mats, a barge having transversely extending roller ways and sheaves between the rollers, a cable carrying drum mounted on the barge, a friction device on the barge adjacent the drum, a launching cable to which mats are to be secured at opposite sides, said cable passing from the drum to the friction device and from said friction device over the sheaves between the ways, and means for operating the friction device to feed the cable and mats from the barge."

"9. In an apparatus for laying revetment mats, a barge having transversely extending ways, sheaves between the ways, a cable carrying drum mounted on the barge, a pair of friction sheaves geared together, a launching cable leading from the drum, over and around the friction sheaves and from said sheaves to and over the sheaves between the said ways and to which mats are to be secured at opposite sides, and means for operating the friction sheaves to feed the cable from the drum."

The court in its opinion of March 7, 1938, held that these claims were valid and that the apparatus covered by them had been used by the United States but that the defendant had an implied non-exclusive license to use this structure and was not liable under the special jurisdictional act.

6. The revetment patent and the launching apparatus patent are interrelated in that together they cover the complete development of an improved articulated concrete revetment with reinforcing launching cables and a mechanical structure for laying or sinking this particular type of revetment.

7. During the accounting period the defendant, through the Mississippi River Commission, fabricated and sank 887,981 squares[1] of articulated concrete revetment, all of which were covered by the terminology of claims 3 and 6 of the Shearer revetment patent, and were sunk by the aparatus covered by the valid claims of the Shearer launching apparatus patent. The total cost of this revetment work was $12,524,620.40.

The following tabulation indicates the district in which the mats were laid, the year of laying, and the cost of fabrication and sinking. This tabulation indicates an average cost of $14.10 per square, and the cost of sinking as 39.6 percent of the entire cost.

[1] Each square equals 100 square feet.

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Fiscal year	District	Number of squares sunk	Cost of building	Cost of sinking	Total
1917	Vicksburg	8,063	$34,378.16	$23,297.88	$57,676.04
1918	do	11,383	66,262.89	43,513.89	109,876.78
1919	do	4,669	42,816.21	21,391.73	64,207.94
1920	do	7,452	110,513.16	55,474.04	165,987.20
1921	do	4,919	70,095.75	41,959.19	112,054.94
1922	do	5,516	44,818.85	16,530.81	61,349.66
1926	do	14,220	74,030.85	126,477.92	200,508.77
1926	do	33,778	231,495.28	306,005.26	537,500.54
1927	do	31,319	195,005.17	262,872.76	458,877.93
1928	do	91,474	669,041.35	520,430.02	1,179,471.37
1929	do	105,746	685,234.08	608,846.51	1,294,080.59
1930	New Orleans	12,668	189,676.29	74,913.82	264,590.11
1930	Vicksburg	73,410	467,344.20	533,074.90	990,419.20
1930	New Orleans	51,370	665,652.18	144,422.83	810,075.01
1931	Vicksburg	70,504	462,506.24	256,644.18	719,150.42
1931	New Orleans	24,062	254,402.97	164,666.90	419,069.87
1932	do	17,483	170,763.49	144,531.28	315,294.77
1932	Memphis	117,269	883,464.00	265,212.90	1,148,676.90
1933	Vicksburg	44,341	373,794.63	404,943.29	778,737.92
1933	New Orleans	29,186	594,110.85	211,778.22	805,889.07
1933	Memphis	129,159	1,295,803.98	735,431.25	2,031,025.18
Total		887,981	7,562,100.73	4,962,519.67	12,524,620.40

8. The Shearer revetment patent does not contain the basic disclosure of an articulated concrete revetment mat. Such a mat is shown in the prior art Canadian patent to Hawkes, No. 110,571. This prior art patent, however, fails to disclose any launching cable or equivalent device incorporated in any way into the structure in order to overcome the difficulties of handling and properly placing such a necessarily heavy and bulky structure.

During the period 1910–1912 the Government did some experimental work with an articulated concrete mat similar to that shown in the Hawkes patent. This work, referred to as the Schultz construction, consisted of a series of concrete blocks or slabs reinforced by crossing wires, the protuding ends of which were formed into eyes, and these blocks were flexibly connected to each other by means of pins, bolts or an anchor cable extending through the eyes of adjacent blocks. Some of these blocks were installed in four localities either on a dry river bank or in shallow water ten to twelve feet out from the bank.

As used, the individual blocks were first placed in final position on the bank and then were subsequently connected
112 to each other. When installed in the water adjacent the river bank about eight rows of blocks were laid on planks running from the shore to the deck of a scow. These blocks were then connected to each other through the alined eyes after they had been put in place on the planks, and the scow was then pulled away from the outer ends of the planks, permitting the planks and the slabs to fall into the water adjacent the shore line. No launching cable or equivalent device was incorporated in any way into this experimental construction.

The Schultz construction was described in the publication, Engineering Record of June 7, 1913, exhibit D–72, listed as part of the prior art considered by the court in its former finding of fact 36. The Government spent approximately $26,500 on these experiments. There is no evidence of any further governmental activity concerning articulated concrete revetments until the development of the Shearer inventions.

9. In its comparison of the Shearer revetment patent with the prior art the court in its former findings of fact (Finding 39) found as follows:

"This construction was of real practical importance because it made it possible to launch the mat over ways having sheaves thereon at the outer ends to carry the launching cables, and which cables in turn carry the weight of the individual blocks individually in their journey from the ways to their resting place on the bottom, thus preventing dangerous accumulation of stresses in the concrete or reinforcing members of single blocks; i. e., the weight of each block of the mat in transit from the ways to the bottom is sustained directly by the launching cables and not by other blocks, whereby each block and its reinforcement are required to sustain only their own weight.

"*This construction, while no more efficient or effective in its protective action than the prior art flexible concrete mattresses once properly placed on the bottom, was capable of being launched in an inexpensive, relatively quick, and completely reliable manner, even in strong currents and deep water, whereas those of the Prior art were not.*" [Italics supplied.]

113 The court amplified this and defined the scope of the invention of the Shearer revetment patent in the following phraseology:

"The distinct difference between the plaintiff's mats and prior ones is embodied in a form of structure whereby each individual concrete mat is so formed and ingeniously attached to the longitudinal launching cables as to form a concrete mattress which, in the process of launching, causes each mat unit to bear its own weight "in their journey from the ways to their resting place" on the bottom of the stream.

* * * * *

"The problem confronting plaintiff was not the construction of individual concrete mats. What the inventor had to do was to take a structure of unusual weight and attach it to cables of unusual strength in such a way as to move the same from one position to another without danger of disruption and without the accompanying danger of never being able to devise a launching appa-

ratus which would operate to accomplish a successful launching of the same.

"The plaintiff's novel method of attachments solved the problem." [Italics supplied.]

The dominant feature of the incorporation of the launching cables and the attachment of the concrete blocks thereto in such a manner as to provide an articulated concrete revetment which was practical and could be launched in an inexpensive and reliable manner solved the problem and was the primary cause for the extensive use of the Shearer type of articulated concrete revetment by the defendant.

10. Plaintiff has not manufactured nor sold revetments under the revetment patent and has not licensed others to manufacture, and there is therefore no loss of profits and no established royalty or license fee for the use of the invention.

11. The only other form of concrete revetment used by the defendant during the accounting period was that known as slab concrete. This included butt slabs and lapped slabs.

During the accounting period and as indicated in the following tabulation, the Government laid in the Memphis district
114 235,165 squares of slab concrete revetment at a total cost of $4,732,192.05, or at an average cost of $20.12 per square. As compared with the articulated concrete revetment covered by the Shearer patent in suit and laid by the Government during the accounting period at a total average cost of $14.10 per square (see Finding 7), this represents a difference in cost per square of $6.02.

Year	Number of squares	Total cost building and sinking
1923	909	$25,348.52
1924	1,055	59,505.24
1927	1,310	43,268.41
1928	13,933	327,114.49
1929	28,707	667,827.74
1930	46,432	1,078,612.81
1931	58,521	1,216,428.18
1932	82,540	1,072,644.52
1933	1,758	240,442.14
	235,165	4,732,192.05

12. A reasonable standard of comparison by means of which the Shearer inventions may be evaluated is the willow mat revetment. This was the revetment most extensively used by the Government during the accounting period and the next lowest in cost to the articulated concrete revetment. The Government made and sank, 1,811,348 squares of willow mat revetment in the New

Orleans, Vicksburg, and Memphis districts during the accounting period.

13. In order to arrive at a just comparison in the cost of the articulated concrete revetments and the willow mat revetments, and to eliminate as far as possible such variables as labor and material cost in different periods and at different localities, such comparison is limited to those revetments of both types laid in the same district and in the same fiscal year. .

Such a comparison, which is made in the following table, gives a total cost per square for the articulated concrete mat of $13.31, as compared to $15.85 per square for the willow mat. Expressed in percentage, the articulated concrete mats averaged 84 percent of the cost of the willow mats.

115 *Tabulation of Comparative Costs*

District and fiscal year	Number of squares of articulated concrete	Cost of building and sinking	Number of squares of willow	Cost of building and sinking
Vicksburg:				
1917	8,053	$87,676.04	54,410	$388,789.24
1918	11,383	109,876.78	25,436	264,384.39
1919	4,659	64,207.94	17,350	230,721.16
1920	7,432	105,987.20	32,779	498,447.46
1921	4,919	112,054.94	29,304	574,455.16
1922	5,516	61,249.68	34,505	412,868.93
1925	14,220	200,808.77	36,621	747,620.17
1926	33,778	537,880.64	20,215	391,147.01
1927	31,319	458,877.93	19,761	321,767.73
1928	91,474	1,[illegible].37	15,966	330,734.38
1929	105,746	1,394,680.89	33,543	695,963.23
1931	70,504	719,180.42	1,271	17,340.99
New Orleans:				
1929	12,668	264,880.11	91,016	1,582,423.73
1930	51,370	810,075.01	51,505	909,241.39
1931	24,062	419,069.87	26,701	377,482.97
Memphis:				
1932	117,269	1,148,070.90	23,314	427,144.09
1933	129,159	2,081,625.18	27,365	523,649.42
Total	723,561	9,634,179.38	550,342	8,731,262.57

14. As set forth in Finding 7, there were 887,981 squares of articulated concrete revetment manufactured and sunk by the Government within the accounting period, at an average cost per square of $14.10. Application of the comparative average percentage value of 84 percent, as indicated in Finding 13, to this cost per square gives a resultant saving in cost of $2.68[2] per square due to the Shearer inventions.

The Shearer revetment patent upon which this accounting is based relates to the manufactured article or mat, and the Shearer launching apparatus patent under which the Government is licensed relates to the mechanism or means for sinking the mats.

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[2] $\frac{14.10}{84} \times 100 - 14.10 = 2.68$.

Of the total cost of the 887,981 mats manufactured and sunk by the Government during the accounting period, 39.6 percent is attributable to the cost of sinking and 60.4 percent attributable to the cost of manufacture.

A reasonable allocation of the savings of $2.68 per mat due to the Shearer inventions is 39.6 percent, or $1.06, to the launching apparatus patent under which the Government has a license, and 60.4 percent, or $1.62 to the revetment patent forming the basis of this accounting.

116 15. The willow mattresses used as the basis of comparison in Finding 13 are of two types: the fascine mattress and the frame mattress.

The fascine mattress consists of a series of round bundles of willow brush about 8 feet long and 12 inches in diameter, tightly compressed and wired together at intervals. The bundles of willow so formed are wired together in the form of a raft. In general, such a mat is constructed on a launching barge, being progressively launched in portions, the mat extending from the bank out in the river bed as far as may be desired.

A crew of men then load the mat with stone ballast consisting of pieces of stone as large as can be conveniently carried by one man, this being known as "one-man stone." This stone is scattered over the entire surface of the mat until its buoyancy is overcome. Thereafter barges are towed over the sunken mat and additional stone ballast dropped into the water to hold the mat in position.

The frame willow mattress consists of a series of top and bottom frame members with willow brush filling compressed between them. The frame members are fastened together with wooden pins and wire nails. Poles are fastened to the top of the frame to separate the mattress surface into pockets in which the ballast or riprap is retained when the mattress is subsequently sunk.

The frame type of mattress is usually built on a river bank and launched, after which it may be towed by a river steamer to the location in which it to to be sunk. It is thus readily adapted for use in locations more or less remote from willow growth. It is sunk in much the same manner as the fascine mattress by first overcoming its buoyancy and then loading it with additional stone or riprap.

16. Neither the willow mattress nor the concrete mattresses are permanent. The average life of a revetment on the Mississippi River has been from two to eight years, although in individual instances the effective life may be much longer.

The life of a given revetment, either willow or concrete, depends upon the location at which it is placed, and its effective life is

determined primarily by the attack of the river upon the re-
117 vetment. Formation of sand bars in the river and erosion of the banks cause a constant shifting of the channel and act to change the angle of attack of the river upon a revetment located at a bend. The height of the water and the volume of water flow also alter the angle of attack. Such changes may either cause the revetment to be flanked [8] by the river at its upper end or flanked at its lower end by eddies caused by a change in the angle of attack.

On the other hand, a deposit of sand or silt may build up on the revetment and the course of the river so change that a revetment is not under any attack from the river either permanently or for a temporary period of time. The effective life of a revetment of either the willow or articulated concrete type is predicated mainly upon the vicissitudes of the river rather than the materials from which the revetments are constructed. Attempts have been made to compare the efficiency of different types of revetment, but as the conditions for each bend of the river and each revetment constantly vary there is no satisfactory engineering data by which to establish the relative effective length of life of the articulated concrete type as compared with the willow type.

17. In the case of both the willow and the articulated concrete mat the metallic cables and wires which hold the willows and the concrete blocks together will corrode and ultimately give way. When this happens in the case of the articulated concrete mat the same then becomes an aggregation of separate concrete blocks, and these may stay in place, provided the attack of the river is not too severe and the river bed is not cut away by the action of the current flowing between the interstices separating the individual blocks.

When the fastenings fail in the willow mat the individual willows are released. Being buoyant, willows may rise and act as an obstruction, tending to set up eddies which disturb the stone or riprap covering and tend to pull it apart. The willows being of organic material are affected by exposure to the water and tend to become brittle over a period of years. In addition, that part of the
willow mat near the water line suffers additional deteriora-
118 tion, in that portions of it may become alternately wet and dry as the river passes through low and high stages.

18. The articulated concrete mat manufactured and sunk in accordance with the Shearer inventions possesses an actual inherent advantage over the willow mat, in that it does not include

[8] A revetment is said to be "flanked" when the river gets in between the revetment and the bank it is intended to protect.

in its construction any pieces of organic material which possess a natural buoyancy and may either deteriorate or become loose.

19. Maintenance of both willow and articulated concrete types of revetment consists mainly in laying new sections of mat over portions of the old where the old mat is being flanked by the river or holes have been formed in the mat by the attack of the current. As maintenance costs depend primarily upon the severity of attack of the river on a mat, and in addition are dependent upon the extent of funds available for maintenance work in a given fiscal year, the comparison of maintenance figures shows largely the differing effect of the river upon the revetments and does not form a proper and sufficient basis for a mathematical calculation of either comparative maintenance costs or relative length of life of the two types of revetments.

20. Summarizing the advantages due to the use of plaintiff's inventions covered by the revetment patent and the launching apparatus patent and obtained by the Government in the manufacture and sinking of the 887,981 squares of articulated concrete mats, as compared to the willow mat, there exist two separate and distinct benefits, as follows:

(1) A reduction in cost of $2.68 per square (Finding 14);

(2) A mat constructed entirely of inorganic material and possessing no natural buoyancy in any of its constituent elements (Finding 18).

Other benefits which exist due to the use of the inventions in suit are too intangible to evaluate in terms of money.

21. A fair and reasonable monetary value to the Government of the benefit set forth in item 2 of the previous finding is the sum of thirty-two cents ($0.32) per square. Adding to this sum the savings in cost of manufacture and sinking per square of $2.68, a fair and reasonable total monetary value for the benefits derived by the United States from the two Shearer inventions is $3.00 per square.

119 A reasonable allocation of this sum between the launching apparatus patent and the revetment patent forming the basis of this accounting is 39.6 percent to the former and 60.4 percent to the latter, or the sum of $1.81 per square of articulated concrete.

22. A fair and reasonable figure upon which to base compensation to plaintiff is 20 percent of the monetary value of $1.81 to the Government from its use of the revetment patent or the sum of $0.36 per square.

The following tabulation shows the application of this sum to the 887,981 squares as applied to the squares of articulated concrete manufactured and sunk each fiscal year:

A Fiscal year	B Number of squares	C Base compensation at $0.36 per square
1917	8,053	$2,902.68
1918	11,383	4,097.88
1919	4,659	1,667.24
1920	7,452	2,682.72
1921	4,919	1,770.84
1922	5,516	1,985.76
1925	14,220	5,119.20
1926	33,778	12,160.08
1927	31,319	11,274.84
1928	91,474	32,930.64
1929	118,414	42,629.04
1930	126,780	44,920.80
1931	94,566	34,043.76
1932	134,752	48,510.72
1933	202,695	72,966.96
	887,981	319,673.16

23. A reasonable compensation to plaintiff for the use of his invention is the sum of $319,673.16. A reasonable amount to be added to make this amount "entire compensation" at the date of payment of judgment is interest at 5 percent per annum on the individual amounts set forth in column C of the tabulation in Finding 22 from July 1 of each corresponding year, given in column A, to the date of payment of the judgment, this amount not being added as interest but as a part of the just compensation.

Conclusion of law

Upon the foregoing special findings of fact, which are made a part of the judgment herein, the court decides as a conclu-
120 sion of law that plaintiff is entitled to recover the sum of $319,673.16, with interest at 5 percent per annum, not as interest but as part of just compensation.

It is therefore adjudged and ordered that the plaintiff recover of and from the United States the sum of three hundred nineteen thousand, six hundred seventy-three dollars and sixteen cents ($319,673.16), with an additional amount measured by interest at the rate of 5 percent per annum on the following sums from the dates specified until paid: $2,902.68 from July 1, 1918; $4,097.88 from July 1, 1919; $1,667.24 from July 1, 1920; $2,682.72 from July 1, 1921; $1,770.84 from July 1, 1922; $1,985.76 from July 1, 1923; $5,119.20 from July 1, 1926; $12,160.08 from July 1, 1927; $11,274.84 from July 1, 1928; $32,930.64 from July 1, 1929; $42,629.04 from July 1, 1930; $44,920.80 from July 1, 1931; $34,043.76 from July 1, 1932; $48,510.72 from July 1, 1933, and $72,966.96 from July 1, 1934.

Opinion

WHALEY, Chief Justice, delivered the opinion of the court:

This is a patent case now before this court for the determination of the amount of compensation to which the plaintiff Shearer is entitled. Plaintiff was in the employment of the United States at the time he made the inventions here in issue, and his case is before us under a special act of Congress (Private Number 285, 71st Congress). The act waived the statute of limitations and instructed the court first to determine whether the plaintiff Shearer was the first, original and sole inventor of the inventions described in three Shearer patents pertaining to concrete revetment construction, and if the court should find that he was such first, original and sole inventor, the court was, to quote that portion of the act relating more directly to the accounting,

"* * * then to determine, second, what amount of compensation, if any, he is justly entitled to receive from the United States for the use of his said inventions or any of them, since the date of said letters patent, up to the time of adjudication. In determining whether or not said David McD. Shearer is entitled to compensation and the amount of compensation, if any, for the use of said inventions the court shall take into consideration, if and so far as the facts may warrant, the facts, if proved, that
121 while said David McD. Shearer, was engaged in perfecting the invention he was in the service of the United States as a junior engineer superintendent in charge of willow bank revetment construction under the Mississippi River Commission, and whether and, if at all, to what extent said inventions or any of them were discovered or developed during the working hours of his Government service, and to what extent his said inventions for protection of river channels and banks differ from the methods previously used, in material, method of laying, permanency, and value, and whether if at all to what extent the expense of making experiments, trials, and tests for the purpose of perfecting said inventions was paid by the United States, and if any such expense was incurred by the United States, whether and, if at all, to what extent the United States received compensation for such expenses. * * *"

In the trial of this case on the issues of validity and plaintiff's right to recover for use plaintiff withdrew any claim on account of Shearer patent 1,173,880, leaving for consideration patent 1,173,879 for an articulated concrete revetment structure, and patent 1,229,152 for an apparatus for launching and sinking concrete revetments.

The court in its special findings of fact and opinion of March 7, 1938 (87 C. Cls. 40), held that claims 3 and 6 of the Shearer

revetment patent were valid, and the inventions defined thereby had been used by the United States and that their origin and development were such that plaintiff was entitled to compensation therefor under the special jurisdictional act. As to the launching apparatus patent, the court held that the plaintiff was estopped from compensation because the contribution of the United States toward the development of this invention and its reduction to practice was such as to give to the Government a shop right or nonexclusive license to use the same. In connection with the opinion of March 7, 1938, this case was referred to a Commissioner of this court to take testimony upon the question of reasonable and entire compensation as to the revetment patent, and it is now before the court on this question and on the objections of the parties to the Commissioner's report. The special act indicated that the amount of compensation be determined "since the date of said letters patent up to the time of adjudication." Therefore
122 the accounting period is from February 29, 1916, to February 28, 1933, the date of expiration of the revetment patent.

Both parties have filed numerous exceptions to the Commissioner's findings. In general, plaintiff has excepted to the Commissioner's findings in so far as they have indicated what the plaintiff thinks is a small recovery. The defendant contends that the Commissioner reports an exorbitant recovery for plaintiff; that the Commissioner's basis for such recovery is predicated upon a false premise and not supported by the evidence, and that plaintiff is not entitled to any compensation or, at best, to a nominal one. It is unnecessary to refer to all of the numerous exceptions in detail except to say that we have considered them, together with additional proposed findings, and we will therefore limit our consideration to what we consider the basic issues.

Defendant's contention that plaintiff is entitled to no recovery is based upon what it calls "an inconsistency" in the court's former opinion (87 C. Cls. 40). That defendant made no motion for a new trial but waited from March 7, 1938, until the termination of a long and intricate patent accounting and now raises this issue for the first time, is contrary to orderly and expeditious procedure.

The alleged inconsistency as stated by the defendant is that the court, having held that the Government had an implied license under the Shearer launching barge patent, should have held also that the defendant had a right to use the revetment structure covered by the revetment patent.

Defendant bases its argument upon the principle that where the owner of a patent grants or sells to a licensee the right to use a patented machine, the grant carries with it, by necessary impli-

cation, a license under any other patent of the licensor which would be infringed by the operation of the machine. Such established principle is of itself sound and there are numerous cases which hold that one who has sold material or granted a license for a valuable consideration to another cannot prevent the buyer from making use of that which has been sold to him.

This principle, however, finds no application in the present situation, because Shearer did not sell or grant any license to the Government. This court in its former opinion merely
123 held that Shearer was estopped to assert his launching apparatus patent because the details covered by the valid claims therein were developed at Government expense, the Government therefore inferentially obtaining a shop right or implied license to use the launching apparatus.

This case is one involving the apportionment of patent rights between employer and employee, pursuant to a special act which directed the court to take into consideration "* * * to what extent said inventions or any of them were discovered or developed during the working hours of his [Shearer's] Government service, and * * * to what extent the expense of making experiments, trials, and tests for the purpose of perfecting said inventions was paid by the United States * * *."

This case is therefore not the usual case involving a vendor and a vendee, and there is no inconsistency in the former opinion of this court, in holding that the plaintiff was entitled to recover on the revetment patent.

We next take up the Shearer revetment patent to which the present accounting relates. While the plaintiff's developments, as compared to the background of the prior art, are set forth in much detail in the various findings of fact, a summarization appears to be necessary for a consideration of the remaining issues.

Revetments are structures that are subaqueous in character and are customarily sunk in a river over the underwater portion of the bank. They are usually located on a river bend, and their purpose is to prevent the river current, which impinges against the bend, from eroding the bank. They have been used extensively on the Mississippi River and the present accounting deals with revetments on that river. The best known and perhaps the oldest type of revetment is that known as the willow mat revetment. These consist of bundles of willow either woven or wired together in the form of a raft, which are placed in position and sunk by means of stone ballast scattered over the entire surface of the mat.

From time to time improvements have been attempted in revetment structures, and the use of concrete has been suggested in the

prior art. In March of 1908 a Canadian patent was
124 granted to Hawkes for an articulated concrete revetment.
In its prior opinion and findings of fact this court referred to the Hawkes Canadian patent as the closest approximation in the prior art to the construction of the Shearer revetment patent. Hawkes disclosed a flexible reinforced concrete revetment mat formed of individual blocks each having its reinforcing wires extending beyond the blocks and formed into loops through which an anchor cable was passed.

The Hawkes structure would be effective once it was in place on the river bottom, and the court so found, but there was no disclosure of any launching cable or equivalent handling device incorporated in the structure by means of which the revetment could be placed.

This is borne out by subsequent developments and the record shows that a pamphlet entitled "Crown Flexible Rip-Rap—The Hawkes System" was received by Major Schulz of the United States Corps of Engineers, in 1910. Irrespective of whether Major Schulz obtained his original suggestion from the Hawkes disclosure, the Government had Major Schulz conduct experimental work from 1910 to 1912 with articulated concrete mats referred to as the "Schulz construction." (See Finding 8). These mats were similar to the Hawkes construction in that they were flexibly connected to each other by means of pins, bolts, or an anchor cable extending through the eyes of adjacent blocks.

The experiments were limited to the use of the mats either on the river bank above the water line or in very shallow water immediately adjoining. In the first instance, the blocks were placed in situ and then subsequently linked together, and in the latter instance they were placed on planks extending some 10 or 12 feet out from the river bank. When the blocks had been placed in position and had been connected together, the barge was then pulled out into the river, permitting the planks and blocks to fall into the water.

Major Schulz, when testifying in the case, when asked if this was a convenient way of launching mattress, answered, "It was practically the only way I knew of." The Government spent some $26,500 on these experiments and then abandoned them.

The Schulz construction, however, was described in a printed publication, "Engineering Record," of June 7, 1913,
125 and therefore became a part of the prior art. This publication was listed in Finding 36 of the court's former findings of fact and was considered by the court at that time, for the initial sentence of Finding 37 states as follows:

"Of these publications and patents mentioned in the foregoing finding, the Canadian patent to Hawkes No. 110,571 (defendant's

exhibit 97) is the closest approximation in the prior art to the construction of the patent in suit."

Other than the Schulz experiments just referred to, the only form of concrete revetment used by the defendant was that known as "slab concrete," in which a plurality of monolithic concrete slabs was separately placed in final position, either abuting or overlapping each other. The cost of building and sinking a unit of this type of revetment, however, was much higher than the cost of similar sized units of either the articulated concrete or the willow mat revetment. (See Finding 11.)

As compared to the background of prior art just discussed, the record tells a different story with respect to the Shearer construction. On or about October 6, 1914, the plaintiff submitted to the district engineer officer an exact and detailed description regarding the method of constructing concrete mats and mattresses, apparatus for their molding, and the mechanism for their launching, together with a discussion as to their availability for subaqueous revetments instead of fascine mattresses. Experiments were begun with the Shearer type of revetment in 1915, and the ultimate result was that between February 29, 1916, the date of issuance of the Shearer revetment patent, and February 28, 1933, the date of its expiration, the Government saw fit to use on the Mississippi River, 887,981 squares of articulated concrete revetment of this type at a total cost or investment of $12,524,620.40. These figures, obtained during the accounting, amplify the correctness of the court's former opinion and its former findings of fact in which the court stated, with respect to the revetment construction covered by the claims in suit of the Shearer revetment patent, that it "was capable of being launched in an inexpensive, relatively quick, and completely reliable manner, even in strong currents and deep water, whereas those of the prior art were not."

126 We have made this comparison not for the purpose of sustaining validity, which we have already determined, but in connection with the method used in the accounting and to which defendant objects. The defendant urges that the Shearer revetment patent was not for an articulated concrete mat per se, but that his invention was merely an improvement over the prior art mat such as the Hawkes mat, and that it only consisted in the improved method of attaching the launching cables to the concrete blocks. On this basis defendant urges that plaintiff has ignored the established rule of apportionment, which places upon a plaintiff in a patent accounting the burden of apportioning the value of that part of the structure covered by his invention as against that which was open to defendant to use, and that plaintiff having failed to properly apportion the value of the cables and their at-

tachment to the launching blocks, has failed to establish a satisfactory basis for an accounting.

While we have used apportionment in the accounting as between the revetment patent and the launching apparatus patent, to which the defendant contributed, we do not think that the apportionment rule applies to the groups of elements specified in claims 3 and 6 of the Shearer revetment patent. These claims cover a novel combination of elements, even though some of them are individually old. There is here no basis for an attempt to segregate patented elements from unpatented elements. The pith of the invention is the entire cooperative combination and not some special details of construction. The Hawkes mattress was not of any value to the Government because its construction was such that it could not be laid in deep water and swift current. The combination of elements expressed in the claims of the revetment patent, to quote from our former opinion in this case, "solved the problem" and thus enabled subaqueous articulated concrete revetments to be used.

This case therefore comes within the entire value rule in which the salability or utility of an article is primarily due to the improvement imparted to the combination. See Hurlbut v. Schillinger, 130 U. S. 456; Crosby Valve Co. v. Safety Valve Co., 141 U. S. 441; Piaget Novelty Co. 1. Headley et al., 123 Fed. 897.

127 In the Hurlbut v. Schillinger case, above cited, the patent was directed to a concrete pavement laid in detached blocks or sections, so that one section could be removed without disturbing the adjacent sections. Concrete pavements were in themselves old, but the Supreme Court said, with respect to the sectionalizing of concrete pavements that—

"The invention of Schillinger was a very valuable one. The evidence is that it entirely superseded the prior practice of laying concrete pavements in a continuous, adhering mass. * * * It clearly appears that the defendant's concrete flagging derived its entire value from the use of the plaintiff's invention, and that if it had not been laid in that way it would not have been laid at all."

The method of computation herein used in arriving at a reasonable compensation consists in (1) arriving at an average monetary advantage per square of articulated concrete fabricated and sunk during the accounting period; (2) apportioning such monetary advantage between the revetment patent here in issue and the launching apparatus patent which the Government by virtue of its contribution is entitled to use, and (3) ascertaining from the total monetary value of the revetment patent to the Government what proportion thereof constitutes a just and reasonable compensation

to plaintiff. See Olsson v. United States, 87 C. Cls. 642, 659, quoting from Mamie C. Wood et al. v. United States, 36 C. Cls. 418, 426:

"But this court, in the leading Case of McKeever, (14 C. Cls. R. 396; affirmed by the Supreme Court, see 18 id., 757), laid down a sufficient rule for such cases. The question to be determined is, What was the invention worth in the market? What would the parties have taken and paid if the matter had come to an express agreement? What would any person needing the invention have been willing to pay for it? * * *"

See also Robinson on Patents, Vol. III, sec. 1062—

"There is no presumption, either of law or fact, that the plaintiff has lost all that the defendant has gained, or that the defendant's advantage is equal to the plaintiff's loss. But the pecuniary benefit which the defendant has derived from the unlawful use of the invention, whether by an increase in the quality of his products and the quantity of his sales, or by a decrease in the
128 expense of manufacture, is a fact from which, in connection with other facts, the jury may infer the amount by which the plaintiff's sales and prices have been reduced through the infringement."

The standard of comparison used in the present case is the willow mat revetment which is the type most extensively used by the Government during the accounting period and which also is next lowest in cost to the concrete revetment. A stipulated set of figures giving the number of squares of each type of revetment, their cost of fabrication and their cost of sinking in the various districts on the Mississippi River, on an annual basis, forms the basis for the comparison.

In order to arrive at an average relative cost value between the willow mat and the concrete revetment, a comparison has been made in a tabulation contained in Finding 13. This comparative tabulation is limited to those revetments of both types laid in the same district and in the same fiscal year, thus limiting as far as possible annual variations in labor costs, and material costs. The costs during the accounting period for each type of revetment have been totalled and divided by the number of squares, and show by comparison that the articulated concrete revetment averaged 84 percent of the cost of the willow mats during the entire accounting period.

Both the defendant and plaintiff object to this method of obtaining the comparative cost. Defendant urges that such tabulation should also contain cost figures for years and districts in which willow mats were laid and no concrete mats were made, or

vice versa. This, in our opinion, does not give as true a comparison as the one which we have utilized and which tends to limit variations in both labor and material costs. Plaintiff, on the other hand, urges that the comparison should be limited to figures involving the same number of mats in a year. As illustrative of plaintiff's suggested method, 8,063 concrete mats were laid in the Vicksburg District in 1917 at a cost of $57,676.04 and in the same year and the same district 54,410 willow mats were laid at a cost of $388,789.24. Plaintiff urges a comparison which would only involve 8,063 willow mats. Needless to say, defendant's suggested method would lower the comparative cost ratio between the
129 concrete and willow mats, and plaintiff's suggested method would raise the cost ratio. We think it to be correct, for the purpose of obtaining merely an average relative cost for the entire accounting period, to make our comparison on what was actually done and to the cost and number of mats actually laid in the same year and in the same district.

As set forth in the tabulation in Finding 7, the Government laid during the accounting period a total of 887,981 squares of articulated concrete revetments at a total cost of $12,524,620.40 or at an average cost of $14.10 per square. Application of the comparative percentage value of 84 percent to this cost per square gives a resultant saving in the combined cost of manufacture and cost of sinking of $2.68 per square due to the use of the Shearer revetment patent and the Shearer launching apparatus patent. Due to the inherent advantages of the concrete mat over the willow mat and its lack of inorganic and buoyant material (see Findings 17 to 20) we have added to this savings in cost, the sum of 32 cents per square, thus giving a fair and reasonable average total monetary value per square for the benefits derived by the United States of the two Shearer inventions of $3.00 per square.

The tabulation given in Finding 7 shows an average relationship throughout the accounting period between the cost of fabrication of the mats and the cost of sinking the mats of 60.4 percent to the cost of fabricating and 39.6 percent to the cost of sinking. Using these same figures as a basis for apportionment of the $3.00 per square as between the revetment patent and the launching apparatus patent, which the Government by virtue of its contributions is entitled to use, we arrive at the sum of $1.81 per square of articulated concrete revetment as the average monetary advantage to the Government due to the revetment patent.

Upon the record in this case, we are of the opinion that a fair and reasonable compensation to plaintiff should be based on 20 percent of $1.81 per square, or the sum of $0.36 per square. This

value, as applied to the 887,981 squares used during the accounting period results in the sum of $319,673.16, and constitutes a reasonable and entire compensation to plaintiff for the use by the United States of the Shearer revetment patent, together with interest at 5 percent on this amount, not as interest but as part of the just compensation, this interest to be calculated in accordance with the periods and amounts specified in the tabulation in Finding 22.

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In its former decision in the present case (87 C. Cls. 40) the court held that—

"The report of the Committees having under consideration the special act in this case indicates that Congress intended no more than to refer the case to this court to be adjudicated as other patent cases are under patent law."

Interest is therefore included not as interest but as part of the entire compensation in accordance with Harry F. Waite v. The United States, 69 C. Cls. 153; 282 U. S. 508.

Judgment is rendered accordingly. It is so ordered.

MADDEN, Judge; and LITTLETON, Judge, concur.

JONES, Judge; and WHITAKER, Judge, took no part in the decision of this case.

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Judgment

At a Court of Claims held in the City of Washington on the 7th day of February, A. D. 1944, judgment was ordered to be entered as follows:

Upon the special findings of fact, which are made a part of the judgment herein, the court decides as a conclusion of law that the plaintiff is entitled to recover the sum of $319,673.16, with interest at 5 percent per annum, not as interest but as part of just compensation.

It is therefore adjudged and ordered that the plaintiff recover of and from the United States the sum of three hundred nineteen thousand, six hundred seventy-three dollars and sixteen cents ($319,673.16), with an additional amount measured by interest at the rate of 5 percent per annum on the following sums from the dates specified until paid: $2,902.68 from July 1, 1918; $4,097.88 from July 1, 1919; $1,677.24 from July 1, 1920;

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$2,682.72 from July 1, 1921; $1,770.84 from July 1, 1922; $1,985.76 from July 1, 1923; $5,119.20 from July 1, 1926; $12,160.08 from July 1, 1927; $11,274.84 from July 1, 1928; $32,-

930.64 from July 1, 1929; $42,629.04 from July 1, 1930; $44,920.80 from July 1, 1931; $34,043.76 from July 1, 1932; $48,510.72 from July 1, 1933, and $72,966.96 from July 1, 1934.

Proceedings after judgment

On March 28, 1944, the plaintiff filed a motion for a new trial.
On April 7, 1944, the defendant filed a motion for a new trial.
On May 1, 1944, the court entered the following order on said motions:

ORDER

IT IS ORDERED this 1st day of May, 1944, that plaintiff's motion for a new trial be and the same is granted to the extent that the conclusion of law filed herein February 7, 1944, is amended
136 by changing the interest date of July 1, 1918, to July 1, 1917, and similarly advancing each of the remaining interest dates one year, the conclusion of law so amended to read as follows:

"It is therefore adjudged and ordered that the plaintiff recover of and from the United States the sum of three hundred nineteen thousand, six hundred seventy-three dollars and sixteen cents ($319,673.16), with an additional amount measured by interest at the rate of 5 percent per annum on the following sums from the dates specified until paid: $2,902.68 from July 1, 1917; $4,097.88 from July 1, 1918; $1,677.24 from July 1, 1919; $2,682.72 from July 1, 1920; $1,770.84 from July 1, 1921; $1,985.76 from July 1, 1922; $5,119.20 from July 1, 1925; $12,160.08 from July 1, 1926; $11,274.84 from July 1, 1927; $32,930.64 from July 1, 1928; $42,629.04 from July 1, 1929; $44,920.80 from July 1, 1930;
138 $34,043.76 from July 1, 1931; $48,510.72 from July 1, 1932 and $72,966.96 from July 1, 1933." Plaintiff's motion for a new trial in other particulars is overruled.

IT IS FURTHER ORDERED that the defendant's motion for a new trial be and the same is overruled.

140 On July 18, 1944, the defendant was allowed to use Appeal Record for Certiorari on motion made therefor and allowed by the court.

On July 26, 1944, the defendant filed a Petition for Appeal to the Supreme Court of the United States, together with Assignment of errors, Statement as to jurisdiction of the Supreme Court, Citation, Request or praecipe for transcript of record and notice and proof of service.

On July 26, 1944, the court entered an order allowing appeal which is as follows:

142 *Order allowing appeal to the Supreme Court of the United States*

This cause having come before this Court on this 26th day of July, 1944, upon the petition of the United States, the defendant herein, praying for leave to appeal to the Supreme Court of the United States for reversal of the judgment herein and that a duly certified copy of the record of this cause be transmitted to the Clerk of the Supreme Court of the United States, and the Court having heard and considered this motion, together with petitioner's statement showing the basis of the jurisdiction of the Supreme Court of the United States to entertain an appeal in this cause, the same having been duly filed with the Clerk of this Court, it is therefore, by the Court—

Ordered and adjudged that the United States, defendant herein, be and it is hereby allowed an appeal from the order and judgment of this Court, and that a duly certified copy of the record be transmitted to the Clerk of the Supreme Court of the United States.

It is further—

143 Ordered that the United States be and it is hereby permitted a period of 40 days from the date hereof within which to file and docket this appeal to the Supreme Court of the United States.

Dated this 26th day of July, 1944.

On August 9, 1944, Appellee's statement opposing Jurisdiction of the Supreme Court and motion to dismiss or affirm was filed.

NOTE.—The defendant's statement as to jurisdiction and appellee's statement opposiong jurisdiction are included under separate cover together with the other parts of the record requested by the defendant.

144 *Order settling and approving transcript of record on petition for appeal*

The within transcript prepared from the original record in this court in the above-styled case having been requested by defendant as that portion of the record material to the errors assigned in the petition of defendant for appeal to the Supreme Court, and such transcript having been considered and found to be an accurate statement of the portions of the original record

material to the errors assigned, the same is this September 1, 1944 hereby settled and approved.

By the court:

RICHARD S. WHALEY,
Chief Justice.

NOTE.—The above mentioned portions of the record referred to above in this Order are transmitted herewith under separate cover.

145 [Clerk's Certificate to transcript omitted in printing.]

146 In Court of Claims of the United States

[Title omitted.]

Motion for leave to use appeal record on petition for certiorari filed July 18, 1944

Comes now the United States, through its Assistant Attorney General Francis M. Shea, and shows this Court that:

1. On May 1, 1944, this Court entered a final judgment in the above-entitled case awarding plaintiff $319,673.16, together with interest thereon as specified. This judgment was entered pursuant to the jurisdiction vested in this Court by the Special Act of December 17, 1930 (Private No. 285, 71st Cong.).

2. Said Special Act provides that "either party may appeal to the Supreme Court of the United States * * * from any judgment in such case, at any time within 90 days after the rendition thereof." Said 90-day period expires July 31, 1944. The United States intends, and is at present taking the necessary steps, to perfect an appeal from this judgment to the Supreme Court of the United States under this provision; and out of abundant precaution (cf. *Colgate* v. *United States*, 280 U. S. 43) also intends and is preparing to file a petition for certiorari.

147 3. Under the rules of the Supreme Court relating to appeal, the appellant is required to file with the Clerk of the lower court, promptly after the appeal is taken, "a praecipe indicating the portions of the record to be incorporated into the transcript," and within ten days thereafter the appellee "may serve and file a designation of additional portions of the record desired to be included." Thereupon, the Clerk of the court from which the appeal is to be taken "shall make and transmit" to the Supreme Court "a true copy of the material parts of the record" (Revised Rules of the Supreme Court, Rule 10, par. 2). The Rules of this Court are silent as to procedure on appeal.

4. In the case of certiorari, the Rules of the Supreme Court provide that the petition for a writ of certiorari to review a judgment of the Court of Claims "shall be accompanied by a certified transcript of the record in that court" (Rule 41, par. 1) which would be identical with the record used for appeal. Under Rule 99 (b) of the Court of Claims, the party requesting a certified transcript of the record "for the purpose of filing a petition for a writ of certiorari in the Supreme Court," is required to file with this Court, within the period provided (which in this case expires August 14, 1944) "an original and five copies of such parts of the record as * * * are material to the errors assigned" and serve a copy thereof upon opposing counsel, who, as in the case of appeal, is given an opportunity to have the designated record augmented.

5. On the appeal in this case, the United States expects to designate for review by the Supreme Court the entire
148 record except those portions pertaining to patent No. 1,173,880, which plaintiff withdrew from this case before consideration by this Court. This record consists of over 2,500 pages of transcript and many voluminous exhibits. When this record will have been certified by the Clerk of this Court to the Supreme Court pursuant to Rule 10 (2) of the Supreme Court, in response to the praecipe to be filed by the United States, it would appear that no useful purpose would be served by proceeding under Rule 99 (b) of this Court for the purpose of designating a duplicate identical record for certiorari. Due to the size of the record in this case, it is estimated that the reproduction of an original and six copies thereof, as provided for in Rule 99 (b), would occupy the full time of 20 stenographers for an entire week. It is believed that such duplication, in a time of severe man-power shortage, should be avoided wherever possible.

6. Further, on the certification of the record to the Supreme Court by the Clerk of this Court, in response to a praecipe on appeal, the record will be printed in the "same way and upon the same terms" whether for purposes of appeal or for certiorari (Supreme Court Rule 41, par. 1). Cf. Federal Rules of Civil Procedure, 75 (h).

WHEREFORE, it is respectfully prayed that this Court enter an order, ruling that when the record is made and transmitted by the Clerk of this Court to the Supreme Court, under Supreme Court Rule 10, par. 2, on a direct appeal under the Special Act, the
149 record need not be duplicated for the purpose of the petition for a writ of certiorari; and further that the assignment of

errors to be filed with this Court on direct appeal shall be accepted in lieu of the petition required to be filed under rule 99 (b) for purposes of certiorari.

(Sgd.) FRANCIS M. SHEA,
Francis M. Shea,
Assistant Attorney General.

Of Counsel:
(Sgd.) J. F. MOTHERSHEAD,
J. F. Mothershead,
Attorney.

Allowed July 18, 1944.

(Sgd.) R. J. W.

[File endorsement omitted.]

150 In the Court of Claims of the United States

[Title omitted.]

Petition for appeal to the Supreme Court of the United States

Filed July 26, 1944

Now comes the United States, defendant herein, and states that on the 1st day of May 1944, this court entered final judgment against it in the sum of $319,673.16, together with interest thereon at the rate of 5% per annum from various dates set forth in the judgment, to the date of payment thereof.

The United States, believing that the judgment of this court is incorrect, prays that it may be allowed to appeal to the Supreme Court of the United States for reversal of the judgment of this court, and that a transcript of the record of this cause, duly certified, may be sent to the Supreme Court of the United States.

The United States submits and presents to the court herewith a statement showing the basis of the jurisdiction of the Supreme Court of the United States to entertain an appeal in this cause.

(S) CHARLES FAHY,
Charles Fahy,
Solicitor General.

151 In the Court of Claims of the United States

[Title omitted.]

Assignment of errors

Filed July 26, 1944

Now comes the United States by Charles Fahy, its Solicitor eneral, and avers that the Court of Claims has erred:

(1) In failing to hold that the Government acquired a license shop-right in patent No. 1,173,879 by virtue of the employer-nployee relationship between the parties.

(2) In holding that an implied license to the Government un-r patent No. 1,173,879 by virtue of the employer-employee rela-onship could be defeated by the prior filing of application for at patent notwithstanding the employment of Government fa-lities and personnel in the design and the actual reduction to ractice of its subject matter.

(3) In failing to find that the Government acquired a result-g license in patent No. 1,173,879 by virtue of its license under tent No. 1,229,152 to make and use the launching device useful ly for producing and laying the mat of patent 1,173,879.

(4) In failing after having made its findings 11, 37, 38 and 39, tered March 7, 1938, and findings 5, 6, 8 and 9, entered February 1944, to allocate in finding 21 a larger percentage or all of the ving to the Government to the launching apparatus patent and lesser percentage or none of the saving to the Government to the revetment patent.

2 (5) In failing, in view of its findings above listed, to apportion the value of the revetment as a whole between e features thereof well known to the prior art and open to de-ndant's use, and the minor improvement of the Shearer patent, ior to the application of the reasonable royalty measure of mpensation.

(6) In applying the entire value rule in determining the value the use of the revetment patent to the Government as the basis which to apply the reasonable royalty measure of compensation.

(7) In awarding interest on the compensation found to be due e plaintiff.

(8) In not finding that the revetment patent is invalid for lack invention.

(Sgd.) CHARLES FAHY,
Charles Fahy,
Solicitor General.

A true copy.
Test:
[SEAL]

JOHN W. TAYLOR,
Assistant Clerk Court of Claims of the United States.

153 *Citation*

Filed July 26, 1944

To DAVID McD. SHEARER

UNITED STATES OF AMERICA, *ss:*

Greetings: You are hereby cited and admonished to be and appear at the Supreme Court of the United States, at Washington, District of Columbia, within 40 days from the date hereof, pursuant to an order allowing an appeal, filed in the Clerk's office of the Court of Claims of the United States, wherein the United States is the appellant and you are the appellee, to show cause, if any there be, why the judgment rendered against the appellee, as mentioned in the order allowing appeal, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

WITNESS, the Honorable R. S. Whaley of the Court of Claims of the United States, at the city of Washington, District of Columbia, this 26th day of July, in the year of our Lord one thousand nine hundred and forty-four.

(Sgd.) RICHARD S. WHALEY,
Chief Justice.

A true copy.
Test:
[SEAL] JOHN W. TAYLOR,
Assistant Clerk Court of Claims of the United States.

[File endorsement omitted.]

154 In the Court of Claims of the United States

[Title omitted.]

Praecipe for transcript of record

To the Clerk of the Court of Claims:

SIR: You are hereby requested to prepare a transcript of the record to be filed in the Supreme Court of the United States pursuant to an appeal allowed in the above-entitled cause, and to include in such transcript of record the following:

Pleadings, arguments and submissions of the case, special findings of fact found by the court, conclusions of law, opinions of the court, orders of the court entering judgment, and all motions,

orders and other papers filed in the above-entitled cause since the entry of judgment, as well as "other parts of the record as are material to the errors assigned," such other parts to include all parts of the testimony filed in the cause and all exhibits save those which may be eliminated by agreement of counsel, or by order of the court on motion of appellant.

Appellant is preparing and will file with the Clerk of the Court as soon as the same can be completed, necessary copies of
155 the "other parts" to be included, in duplicate to provide for service in the absence of agreement of counsel to the contrary.

Respectfully,

CHARLES FAHY,
Solicitor General.

156 In the Court of Claims of the United States

[Title omitted.]

Amended praecipe

To the Clerk of the Court of Claims:

SIR: The original praecipe in the above-entitled case requested you to transmit "other parts of the record as are material to the errors assigned" to include "all parts of the testimony * * * and all exhibits save those which may be eliminated by agreement of counsel, or by order of the Court on motion of appellant."

Please be advised that counsel have agreed that the record include only the following exhibits:

1. Exhibits referred to in the Findings of the Court:

Plaintiff's main exhibits: Nos. 1 through 7.

Defendant's main exhibits: 1, 2, 3, 4a, 10, 25, 26, 33, 71, 72, 76a, 76b, 78, 79, 91, 94, 94a, 95, 96, 97, 98, 99, 100, 104, 106a, 106b, 111, 115a through 115f, 116, 117, 118, 119, 120 and 121a through 121f.

157 2. Exhibits to be included in "other parts":

Plaintiff's main exhibits: Nos. 8, 13, 14, 15, 17, 18 (including appended exhibits A to E), 19, 20a, 20b, 21a through 21d, 23, 24, 26, 27, 28, 29, 30, 31a through 31u, 32a through 32h, 33a, 33b.

Defendant's main exhibits: Nos. 7, 12, 12a, 14, 18, 18a, 19, 31, 31a through 31d, 32, 34, 35, 36, 37, 39, 48, 49, 52, 53, 64, 66a through 66k, 67a through 67c, 68, 69a through 69e, 70, 74a through 74e, 75a, 75c, 77a, 77b, 84d, 84g, 84o, 85p, 84q, 84v, 92, 93, 101, 102, 103, 105, 106d and 107.

Plaintiff's exhibits on accounting: Nos. PA–34; –35a thro
–35ii; –36a through 36h; –37; 38a through 38u; 39a through
40 and 41.

Defendant's exhibits on accounting: DA–26; –32; –44 and

The appellant is furnishing herewith two copies of the "o
parts of the record" suitably indorsed, and including all the t
mony and exhibits above agreed to, except those referred to in
court's findings and automatically included in the record,
except plaintiff's main exhibits 26 through 30 which are phys
exhibits (models) filed with the court.

Respectfully,

CHARLES FAHY,
Solicitor Genera

158 In the Supreme Court of the United States

Order extending time within which to apply for a writ of certiorari

On consideration of the motion of counsel for the petitione
the above-entitled cause, and good cause therefor having
shown, it is now here ordered that the time within which a peti
for writ of certiorari may be filed is hereby extended for a pe
of sixty (60) days from August 1, 1944, i. e., to September 30, 1

HARLAN F. STONE,
Chief Justice of the Supreme Court of the United State

File No. 48,877. Court of Claims. Term No. 424. The Un
States, appellant, *vs.* David McD. Shearer. Filed Septembe
1944. Term No. 424 O. T. 1944.

U. S. GOVERNMENT PRINTING OFFICE: 1944